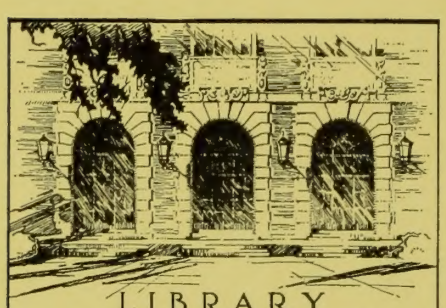

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1911.

VICTORIA.

DEPARTMENT OF MINES.

# MEMOIRS

OF THE

# GEOLOGICAL SURVEY OF VICTORIA

(E. J. DUNN, F.G.S., DIRECTOR)

ISSUED BY

W. DICKSON, SECRETARY FOR MINES, UNDER THE AUTHORITY OF THE HON. PETER McBRIDE, M.P., MINISTER OF MINES.

No. 10.

# THE WEDDERBURN GOLD-FIELD

(WITH MAP, SECTIONS, PLATES, AND FIGURES),

BY

O. A. L. WHITELAW.

## APPENDIX:—PETROGRAPHICAL NOTES

BY

D. J. MAHONY, M.Sc., F.G.S.

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# THE WEDDERBURN GOLD-FIELD.

## SITUATION.

The township of Wedderburn is situated 50 miles N.W. of Bendigo in longitude 143° 25 E. and latitude 36° 26′ S., and is the terminus of a small branch railway from the Bendigo to Charlton and Wycheproof main line. The Wedderburn railway station is 657′ above sea level. The township is situated practically in the centre of the gold-field, and has a population of about 1,000 inhabitants; those not employed in business pursuits are engaged in agriculture or the extraction of eucalyptus oil from the mallee scrub, which grows luxuriantly upon the poorer soils; and a few are still turning over the almost exhausted drifts of the old auriferous alluvial flats. Some half dozen men are engaged in prospecting for, or working, quartz lodes, and it is to serve them that a small crushing battery of five heads has been erected by the Government on the western side of the town.

## PHYSICAL FEATURES.

Two broad branches of a small stream, known as Korong Creek, cross the Wedderburn gold-field, the one running almost due north from the southern end of the field and junctioning near the police court buildings, with a branch from the west. The united stream continues in an easterly direction for about four miles to Wedderburn Junction railway station, and then north and north-east to the Loddon river The country is everywhere drained by small gullies or valleys separated by low and generally rounded spurs, some fifty feet above the level of the valleys. Some contrasts to the general evenness of the topography are, however, exhibited by the occasional occurrence of isolated, more or less conical hills attaining a maximum height of two hundred feet above the valleys, or one hundred feet above the general level of the normal spurs. Upon examination, these hills, such as Sugar-loaf hill, Hard hill, Gowk's hill, Chinamen's hill, Quartz hill, etc., are found to consist either of exceptionally large outcrops of quartz, or to be capped by the hard cemented washes of the Pliocene age; they have thus offered much greater resistance than the other rocks to the long continued forces of denudation to which this area has been subjected.

A further, but more general contrast, is offered by the greater elevation of the country along the eastern edge of the palæozoic rocks near the line of their contact with the intrusive granitic series; this elevation has the appearance of a range running north and south, and about a mile in width, but near its centre it is broken through by the valley of Korong Creek. It is the direct consequence of the resistance to denudation offered by the baked and hardened palæozoic sediments along the line of contact metamorphism. Contact metamorphism is also the cause of the general elevation of the country some miles west of Wedderburn, in the vicinity of Woosang and the "Nine Mile."

To an observer standing upon any elevated point near the township of Wedderburn the following physical features will present themselves:—To the south is the prominent mountain range which takes its name from its highest point, Mount Kooyoora; coming north, the country falls, at first rapidly and then more gradually, towards Wedderburn, sending to the east and west two wing-like areas of the metamorphized rocks, which weather into more rugged forms and less rapidly than the central area, which is about 3 miles in width, of lesser elevation, and composed of sedimentary Ordovician rocks comparatively unaltered and more easily denuded. It is from this low-lying area that practically all the gold of the Wedderburn field has been won.

To the east is seen the prominent cone-like granite peak of Mount Korong, standing some 700 feet above the surrounding plains. Westwards from Korong the descent is rapid to the plains and slightly undulating country of Wedderburn Junction, which continue to within three miles of Wedderburn township; the comparatively rapidly-rising ranges of metamorphic rock with granite at their base succeed, and continue nearly to the township of Wedderburn, where we have the trough-like area of the gold-field, with its undulating hills and broad valleys, so productive of alluvial gold. Westward rise the broken metamorphic ranges of Woosang and Nardoo, and northward, with the exception of the range known as, "The Granites," the country continues gradually to sink until the older rocks are lost under the great plains of the Avoca and Loddon rivers.

Anybody conversant with mining is immediately impressed by the remarkable manner in which the water-courses, even to the smallest gutter, have been turned over in the search for alluvial gold, and by contrast, the comparative absence of evidence of sustained search for the source of the alluvial gold in the numerous outcropping quartz reefs of the auriferous belt. One set of poppet-legs and a few lines of shallow shafts are all that meet the eye.

## DISCOVERY AND EARLY HISTORY.

The locality now known as Wedderburn appears to have been first held as a sheep-run by Mr. D. Peters, and was then known as "Torpichen," the original name of the pre emptive right, which is now known as "Ilion" and held by the Messrs. Gray Bros.

In Mr. Peters' employ was a shepherd named Brady to whom must be given the honour of the discovery of gold at Wedderburn. The exact date of this event is said to have been the 10th of May, 1852, and the first payable gold obtained on the 20th of the same month. The first point at which gold was found was Welshman's Point, Golden Gully; this was closely followed by discoveries at Queen's Gully and a portion of the Main Flat. It is interesting at this point to note that the first gold was discovered in an escarpment of Pliocene wash, and not in one of the recent valleys which afterwards proved so rich.

Following the discovery the usual "rush" immediately set in, and by December, 1852, from 6,000 to 7,000 men were on the field.

To June, 1853, the population rapidly decreased until there were not more than 100 men on the field, and then remained stationary until 1855. The main cause of this efflux seems to have been the want of water for mining purposes.

With the rains in the middle of 1855, 800 men were again on the field, but no new ground being discovered, the population again fell to 400. In November, 1855, Messrs. D. Leighton, W. Gilfillen, and I. Steel opened what is known as "Smith's Patch," which covered an area of about 20 acres, near the police camp. This appears to have been unusually rich, and in December every man on the field was on payable gold. This again caused a considerable increase of population, and as a result a large amount of genuine prospecting was undertaken, and numerous new gullies discovered.

The gullies, flats, and cement hills were first worked, as nearly as possible, in the following order, viz.:—

Golden Gully, 1852, by Brady and four South Australians (H. T. Culling, W. Adams, R. Higgs, and T. W. White).
Queen's Gully, 1852, by Joseph Norris and party.
Main Flat (upper end), 1852, by Brady.
Nursery Gully, 1852, by Brady.
Steel's Gully, 1852, by Steel and party.
Poverty Gully, 1853.
Schicer Gully, 1853.
Queen's Gully Cement, 1854, by Waterman.
Welshman's Point, 1854, by William Jones and party.
Possum Point, 1854, by T. Cosh and party.
Smith's Patch, 1855, by Leighton, Gilfillen, and Steel.
Bocca Flat, 1856, by Thatcher and party.
Potter's Hill Gully, 1856, by John Reach and Richard Gayton.
Bageries (Beggary) Hill, 1856, by James Bungerry.
Bageries Gully, 1856, by James Bungerry.
Ironbark Gully, 1856, by William Taylor.
Tambourine Gully, 1856, by R. Baker and J. Martin.
Main Flat (middle), 1856, by J. and C. M. Holloway.
Glasgow Hill, 1857, by J. Somerville and W. Turnbull.
Attwood's Gully, 1857, by Edward Attwood.
Farmer's Gully, 1857, by W. Sherman and party.
Jerusalem Gully, 1857, by Burnie, Wright, and Welsh.
Italian Point, 1857, by Frank Gallagher.
Sailor's Gully, 1858.
Magpie Gully, 1858, by C. M. Holloway and W. Saunders.
Peep o' Day Gully, 1859, by Samuel White.
Virgin Gully, 1859, by "Aberdeen Geordie."
Silverdale Gully, 1860, by William Balderson.
Yorkshire Flat, 1860, by E. Flannery and mate.
Barnes' Gully, 1862.
Snake Gully, 1864, by Burnie and Bowell.
Long Gully, 1866, by Michael O'Brien.
Maryborough Gully, 1883, by Chadwick and Dupree.
Tinpot Gully, 1883, by H. De Marchi.

Quartz-mining followed quickly upon the discovery of alluvial gold. Numerous gold-bearing quartz specimens appear to have been picked up during 1852–3, and it was from this fact that Specimen Hill derived its name. In June, 1853, Mr. John Kerr and mate—who may be considered the pioneer quartz-miners of this field—sank a round shaft (still existing) on the western side of the outcrop of the Specimen Hill reef, and intersected the quartz at 30 feet. They struck stone from which they obtained a few ounces of gold by crushing with the pick end; but this process not proving sufficiently profitable the enterprise was abandoned at the end of 1854. Mr Benjamin Jones erected a primitive Chilian mill, driven by horse power, to crush the ore obtained from this reef. It is not known to what extent he was successful, but as he continued to work the ground until the end of 1856 it is assumed that his labours were profitable. The first public crushing plant erected in the district was at Kingower; the cost of crushing and carting from Wedderburn was £10 per ton.

The first public crushing plant on the field was erected at the foot of Steel's gully in 1859 by Mr. Archibald Milne.

Public mining companies have operated upon the following reefs in this district, but in no one instance has the work proved profitable, though it is only just to say that the mining—so far as prospecting is concerned—was of a particularly poor nature, funds, in the case of Lane's reef, not lasting long enough to allow the stone to be cut.

Public Companies:

Specimen Hill G. M. Co., 1859.
Campbell's Reef G. M. Co., 1861 (Tenny and Clarke Co.).
Lane's Reef G. M. Co., 1861.
Champion Reef G. M. Co., 1888.
Victory G. M. Co., 1890 (Jackson's).

The want of success experienced by these companies could have no other effect than to completely retard the development of the quartz reefs below water level, and has also tended to produce in the minds of both investors and prospectors—more especially those not well acquainted with the general conditions of the field—a feeling of doubt as to the auriferous nature of the lodes with depth. Practically the whole of the gold won from the reefs of this area has been obtained by co-operative parties, and these have now so far dwindled that probably not more than half-a-dozen legitimate reef prospectors remain on the field.

The only crushing plant on the field at the present time is a light five-head battery, erected by the Government.

## GEOLOGICAL FORMATIONS.

The main rock masses at Wedderburn may be roughly divided into two principal groups :—

1. The Lower Palæozoic Sedimentary series.
2. Intrusive granitic masses.

The action of the latter on the former has given rise to

3. The Metamorphic series.

The remaining rocks in this district are formed from the detritus which has accumulated during the long period to which the older rocks were exposed to denudation ; they fall into two groups :—

4. Cainozoic.
5. Recent.

### 1. Lower Palæozoic Sedimentary Rocks.

These consist of beds of marine origin, composed for the most part of slates and mudstones of the very finest nature ; sandstones are not common, and when found are seen to be very little coarser in texture than the surrounding slates. From their appearance there can be no doubt that these beds belong to the Ordovician period, but whether high or low in the series there is neither stratigraphical nor palæontological evidence to determine. That fossils have existed, and may yet be found at some distance below the surface, I have no doubt, but the crushing to which the beds have been subjected, together with the great amount of surface decomposition, makes their discovery very difficult.

Some remains, which I believe to be organic, were secured from the indicator in Brockwell's shaft, Potter's Hill, and submitted to Dr. T. S. Hall, M.A., for examination. He says, "These specimens are extremely indistinct, and I am not satisfied that they are graptolites at all. Still it is possible that they are, and if so, they are apparently Diplograptidæ, and probably Upper Ordovician. It is, I venture to suggest, worth while causing better material to be searched for at this locality." I doubt, however, unless deeper sinking is carried on at this point, if better specimens are likely to be secured.

At the surface the slates are for the most part of a greyish white or greyish blue colour, but the presence of iron in many parts has tinged them various shades of red and brown ; this is particularly noticeable in proximity to the dykes and some of the reefs. Occurring sparsely through these beds (sometimes in a single band an inch or so in thickness, and again, as on the Hibernian line of country, in successive beds extending over 100 feet), are bands of dark blue to almost black slates, to which the general name of "Indicator" country has been given. (See Plate 23.)

The few artificial openings on the fields, such as the railway cutting, show that the beds have been folded sharply and frequently into anticlines and synclines (see Plate 3, Fig. 2, Plate 4, Fig. 1, and Plate 23), and the country has been faulted and ruptured in every conceivable way. As will be seen from the section of the western end of the railway cutting, the beds have been so disturbed that it is impossible to correlate the bedding ; in fact, the western beds seem to have been let down in a large trough-fault. This condition appears to apply to the whole of the beds of the district, and has been the direct consequence of the production of so much quartz over the area. The faults, but more particularly the fractured country adjacent to them, have been filled with quartz, which frequently occurs in greater abundance than the original rocks. Another section is exposed in Holloway's tunnel. (See Plate 22.)

The folding, as stated, is well developed, and occurs sharply over the axis. A "list" of the axis of one in ten to the eastward is exhibited whenever a good section of the folding can be observed, and this, coupled with the sharp dip of the "legs," gives the whole of the beds the appearance of dipping east ; it also makes the task of working out the stratigraphical sequence a practical impossibility in the absence of fossils. Despite the fact that practically every shaft and natural section was examined, I was unable to obtain any satisfactory information as to the succession of the beds, and I doubt if it can ever be elucidated without palæontological evidence on account of the extreme folding, faulting, and decomposition.

The average strike of the beds is N. 5° W. (magnetic) as far as a little north of Queen's Gully, and thence N. 9° W. to the northern boundary. The point at which the strikes alter appears to continue E. and W. on a definite line for some distance, and probably marks the position of a strong cross course or fault. It is accompanied by a dyke running nearly east and west.

All the pitches observed south of Korong Creek (Main Flat) are to the south ; and to the north of that creek, to the north. It is possible that a dome-shaped fold occurs approximately at the position of the creek.

It is apparent from the large amount of iron staining at the surface of the Ordovician rocks that large sulphide bodies must occur below the level of decomposition. Solid bodies of limonite, of lode-like form, may be traced for distances of a mile or more, and attain a thickness of from 1 to 5 feet.

Samples of these submitted to Mr. P. G. W. Bayly, at the Mines Laboratory, gave the following result :—

| No. | Locality. | Iron. | Gold. | Silver. |
|---|---|---|---|---|
| 1908. | | Per cent. | | |
| 43 | South side of Specimen Hill ... ... ... | 49·45 | Trace | Nil |
| 44 | De Marchi's workings East of Specimen Hill ... | 44·04 | Trace | Nil |
| 45 | Outcrop on road near Cosh's house, about 10 chains N.W. of public gardens ... ... ... | 46·08 | Trace | Nil |
| 46 | 3 chains East of Black Rock ... ... ... | 36·08 | Trace | Nil |

The high degree of decomposition to which the Ordovician sediments have been subjected, has resulted in the formation of large bodies of clay *in situ*. They are of various colours, ranging from white to greyish and greenish white, brown, yellow and red. To ascertain their economic value for pottery or tile making, sixteen samples were submitted to Mr. Bayly.

These clays were made into briquettes, and, after being air dried, were burned under known conditions. The general results are given below and the details are placed in tabular form. For convenience of treatment the results obtained on treating three samples of decomposed granite and three clays formed by the decomposition of dyke rocks are here included.

Lab. No.

1907.

628 .. White pipe-clay, White Hill; little binding power and of poor quality.

629 .. White pipe-clay, White Hill; little binding power, but possibly of use for pottery.

630 .. Yellowish-white clay, footwall of reef, southern extension of Queen's Gully line; little binding power, but possibly of use for pottery.

1908.

115 .. Fine yellow clay, western end of railway cutting, Wedderburn Station; suitable for tiles, bricks, and roofing materials.

116 .. Fine white clay, tunnel, Sugar Loaf Hill; suitable for stoneware, drain pipes, &c.

117 .. Fine yellow clay (dyke), from shaft, Nine-Mile road, Potter's Hill line of reef; less firm than No. 115.

118 .. Decomposed granite with quartz grains, north-east corner of block 15, Parish of Wedderburn; probably suitable for fire brick and fire clay.

119 .. Decomposed granite with quartz grains, Main-road, in front of Mr. Tonkin's house; similar to No. 118.

232 .. Decomposed dyke, Potter's Hill line; inferior clay, too fusible for bricks.

233 .. Tunnel, Hard Hill; suitable for tiles or bricks, but has a high shrinkage.

234 .. Tunnel, Hard Hill; no value owing to edge fusion.

235 .. Decomposed dyke, Brockwell's new shaft; would make inferior vitrified ware.

237 .. Decomposed granite, near Wedderburn Junction railway station; see report and analysis on p. 9.

240 .. Tunnel, Hard Hill; suitable for inferior vitrified ware.

282 .. Dirty white clay, White Hill; soft, friable, very little binding power, only fit for the commonest uses.

283 .. White clay, White Hill; soft, friable, very little binding power; might be of use for vitrified stoneware; at a lower temperature makes a fairly white tile.

284 .. White clay, White Hill; similar to No. 283.

285 .. Reddish-yellow clay, White Hill; soft, friable, with very little binding power, but makes a good red tile at low firing.

287 .. White clay, footwall of reef, southern extension of Queen's Gully line; similar to No. 283.

291 .. Yellowish-white clay, footwall, Brockwell's workings, Annie Jones' line of reef; good red tile at low firing.

| Lab. No. | Air Dried. | | Muffle. Temperature, 1100° C. | | Wind Furnace. Temperature 1340°. | |
|---|---|---|---|---|---|---|
| | Shrinkage. | Remarks. | Shrinkage. | Remarks. | Shrinkage. | Remarks. |
| | % | | % | | % | |
| 1907. | | | | | | |
| 628 | .. | White, very friable .. | 14·5 | White, part edge fusion .. | 14·5 | Partial fusion and complete vitrification |
| 629 | .. | White, friable .. .. | 9·5 | White, clean hard tile .. | 14·5 | Vitrified, bluish-grey |
| 630 | .. | White, friable .. .. | 12·5 | Yellowish-white, edge fusion | 12·5 | Vitrified, incipient fusion |
| 1908. | | | | | | |
| 115 | Nil | Yellow, plastic .. .. | 6 | Fine red tile, clean sharp edges | 14·5 | Over-burned, incipient fusion |
| 116 | Nil | White, plastic .. .. | 4·5 | White hard briquette .. | 16 | Vitrified |
| 117 | 3 | Yellow, plastic .. .. | 3 | Good red .. .. | 9·5 | Chocolate-brown |
| 118 | 1·5 | Very siliceous .. .. | 3 | Soft white tile .. .. | 6 | Light yellow, quite infusible |
| 119 | Nil | Very siliceous .. .. | 1·5 | Soft white tile .. .. | 8 | Quite infusible |
| 232 | 2 | Yellow-brown, fairly plastic | 8 | Dark brownish-red, fused at edges | 16 | Black, vesicular, fused |
| 233 | 4 | Light yellow, fairly plastic | 10 | Salmon-pink, good tile, no fusion | 15 | Brown hard brick, no fusion |
| 234 | 3 | Dirty white, fairly plastic .. | 7 | Yellowish-white, fusion on surface of sides | 12·5 | Yellowish-white, with peculiar efflorescent fusion on sides |
| 235 | 3 | Drab, fairly plastic .. | 9 | Whitish-brown, fair tile, poor colour, no fusion | 14 | Blackened, over-burned, incipient fusion |
| 237 | 1 | Dirty white, micaceous sheen, no binding power | 10 | Soft, infusible .. .. | 6 | White, mottled, soft, infusible |
| 240 | 1 | Salmon-pink, non-plastic .. | 9 | Brown, discoloured hard tile, poor colour, no fusion | 12·5 | Dull grey, incipient fusion, vitrified |
| 282 | 1·5 | Friable, non-plastic .. | 11 | Hard burned, edges fused | 12·5 | Heavy glaze, quite vitrified, vesicular |
| 283 | Nil | White, non-plastic, soft .. | 9·5 | White tile, no fusion .. | 14·5 | Bluish-white, surface glaze, vitrified |
| 284 | Nil | Dull white, non-plastic, friable | 6 | White hard tile, no fusion .. | 14·5 | Bluish-white, surface glaze, vitrified |
| 285 | 1·5 | Reddish-yellow .. .. | 9·5 | Red .. .. .. | 14·5 | Yellow-brown, surface glaze, vitrified, vesicular |
| 287 | 3 | Dull white, non-plastic, friable | 8 | White hard tile, slight vitrification | 16 | Surface glaze, vitrified |
| 291 | 3 | Drab, slightly plastic, firm briquette | 8 | Red hard tile, slight vitrification | 16 | Black, surface glaze, vitrified |

Two of the clays were analyzed and their mineral composition estimated in the usual way from the figures so obtained. No. 630 (1907), from the footwall of the southern extension of the Queen's Gully line, is a typical example of the ordinary Wedderburn clays. The decomposed granite, No. 237 (1908), from near the railway station, Wedderburn Junction, bears a superficial resemblance to the well-known and valuable Cornish stone, but differs essentially from it in being refractory, in having little binding power, and in being friable, even when strongly burned.

| | Sample No. 630 (1907). | | Sample No. 237 (1908). | |
|---|---|---|---|---|
| | Clay dried at 110° C. | Portion insoluble in $H_2SO_4$ and $Na_2CO_3$. | Clay dried at 110° C. | Portion insoluble in $H_2SO_4$ and $Na_2CO_3$. |
| $SiO_2$ .. .. .. .. | 62·38 | 34·19 | 63·47 | 31·26 |
| $Al_2O_3$ .. .. .. | 23·62 | 1·72 | 25·02 | 0·41 |
| $Fe_2O_3$ .. .. .. | 1·17 | Trace | 1·75 | Trace |
| FeO .. .. .. .. | 0·25 | .. | n.d. | n.d. |
| MgO .. .. .. | 1·11 | Nil | 0·24 | Trace |
| CaO .. .. .. .. | Trace | Nil | Nil | Nil |
| $Na_2O$ .. .. .. | 0·56 | Nil | 0·05 | 0·26 |
| $K_2O$ .. .. .. .. | 4·87 | Nil | 0·19 | |
| $H_2O+$ .. .. .. | 4·98 | .. | 8·78 | – |
| $TiO_2$ .. .. .. | 0·76 | n.d. | 0·76 | Nil |
| Total .. .. | 99·70 | 35·91 | 100·26 | 31·98 |
| $H_2O$ lost in drying .. .. | 0·26 | – | 1·32 | .. |

## Rational Analyses.

| Sample. | No. 630. | No. 237. |
|---|---|---|
| Quartz sand .. .. .. | 28·16 | 29·82 |
| Clay substance .. .. .. | 63·80 | 68·33 |
| Felspar .. .. .. .. | 7·74 | 2·11 |
| Total .. .. .. | 99·70 | 100·26 |

## Composition of Clay Substance.

| Sample | No. 630. | No. 237. |
|---|---|---|
| $SiO_2$ .. .. .. .. | 44·20 | 47·13 |
| $Al_2O_3$ .. .. .. .. | 34·33 | 36·01 |
| $Fe_2O_3$ .. .. .. .. | 1·83 | 2·56 |
| FeO .. .. .. .. | 0·39 | .. |
| MgO .. .. .. .. | 1·74 | 0·35 |
| CaO .. .. .. .. | Trace | Nil |
| $Na_2O$ .. .. .. .. | 0·87 | .. |
| $K_2O$ .. .. .. .. | 7·63 | .. |
| $H_2O$ .. .. .. .. | 7·81 | 12·84 |
| $TiO_2$ .. .. .. .. | 1·20 | 1·11 |
| | 100·00 | 100·00 |

## 2. Granites.

These rocks outcrop an area of about 27 square miles within the area surveyed (covered in part with Recent and Pliocene deposits), and stretch for many miles beyond in an easterly direction, and probably underlie the plains of the Loddon Valley. Three distinct divisions must be made.

(*a*) The oldest granite is seen to best advantage on and around the prominent peak of Mount Korong.

It consists of quartz, white orthoclase felspar in large crystals an inch in length, and biotite mica. It weathers into bold outlines forming bosses, tors, small caves, and holes of quaint design. The coarse nature of this granite is shown in photograph Plate 9, Fig. 2. The appearance of the outer surfaces of the rocks facing east is shown in Plate 2, Fig. 2 and Plate 3, Fig. 1. This is probably due to the alternate expansion and contraction caused by the early morning sun striking directly on to these faces during frosty weather.

(*b*) The younger granite occurs to the north of Mount Korong in blocks Nos. 60, 58 of B, 57, &c., and consists of an even grained granular admixture of quartz, pink and white felspar in about even proportion, small crystals of muscovite mica, and occasionally some biotite. This granite is distinctly intrusive into the older, coarse grained variety, as shown in photo, plate 1, which was taken along the line of contact; it also throws dykes for some hundreds of feet into it, and these become distinctly saccharoidal as they are traced into the primary granite.

Into both these granites there has been intruded a considerable number of dykes. One of them which occurs on the eastern boundary of the sheet in block 56 is apparently a felspar-porphyrite, and is the only one of its kind I have observed. The dykes are more numerous in the primary granite, and appear to be pegmatites containing a considerable intergrowth of muscovite mica.

(*c*) The third variety of granite occupies the low-lying ground surrounding the outcrops of the other two. It extends over a large area, and I have also noticed it occurring commonly at Moliagul, McIntyres, Rheola, and other places in the same belt.

It is always decomposed, is very white, of low specific gravity and consists of two kinds of felspar, white mica, and quartz grains.

Whether this granite is distinct in itself, or merely the result of the decomposition *in situ* of the two granites previously mentioned, I am unable to say ; but of these two granites the more ancient has a single felspar, while the other does not appear to be in sufficient quantity to supply the material. Mr. E. J. Dunn pointed out to me a strong similarity between this granite and the famous china-stone of the Isle of Jersey. To test its value as a clay for pottery making or other purposes, two samples were forwarded to the Laboratory for experiment. The results indicate that this rock is worth further attention, though its properties are quite different from those of Cornish stone (see Plate 9.) It is quite infusible, and would probably be suitable for fire clay and fire brick.

In proximity to the Ordovician beds the granites become hornblendic, and at the contact, and when intruded into the Ordovician along the line of contact, they are true granodiorites ; these, however, may have been intruded at a later date than the main mass, or mark the final phase of plutonic activity.

The granite outcrop shown at the top of Hanson's paddock near the head of Scott's Flat about 2½ miles south-east of Wedderburn has the appearance, when studied in the field, of being completely transmuted metamorphic (Ordovician) rock.

There is no field evidence to determine the age of the granitic rocks beyond the fact that they have been intruded into the Ordovician beds, and that the Pliocene deposits are formed in part of the products of their decay.

Quartz reefs are not common in the granite, but some small quartz lenticles and leaders may be observed along the contacts of the dykes and the older rocks ; they do not appear to contain any metals of economic value.

### 3. Metamorphic Rocks.

These beds occupy the eastern portion of the gold-field. They run in a northerly and southerly direction along the granite contact, and extend from 1 to 2 miles westward from it. The width of altered rocks is not altogether due to metamorphism in a lateral direction, but rather to the fact that for at least a mile west from the contact the beds are closely underlain by the granite. Probably, at no point for this distance does its depth exceed 500 feet. The granite can, in fact, be seen outcropping up the valley of Korong Creek, as far as Block No. 17, near the township of Wedderburn.

The beds were, no doubt, similar to and part of the Odovician rocks already described, but the effect of the great plutonic masses east of, and under, them has been to completely alter their general appearance. In place of the soft mudstones and slates of the gold-field proper, we have hard, flinty rocks outcropping at the surface through a sparse accumulation of soil. They consist, for the most part, of mica schists, hornblende schists, and sandstones converted into quartzites. In many cases, the divisional planes have been so filled with mica that the ground is covered with shining spangles when the rock disintegrates. The zone of apparent metamorphism decreases as the township of Wedderburn is approached. The boundary is indicated on the map by a line placed, as nearly as possible, along the junction of the hard, altered rocks and the softer beds of the gold-field. Some more of less circular patches, as on Specimen and Eclipse Hills, show distinct signs of contact metamorphism.

It must not be thought that the belt indicated as Ordovician has been exempt from metamorphism, for distinct evidence of alteration is apparent, but the process has not been a hardening one, and the new characteristics produced by it on the rocks are different from those in the typical metamorphic area. It is evident that the action was deep-seated, and it appears to have occurred most actively along certain narrow belts conforming to the strike of the country. The effect has been to produce nodular-schists. At the surface they are quite soft. These nodules are often of considerable size—up to ½ an inch in diameter—and contain a ferro-magnesian mineral. The rocks are usually too decomposed to enable a more definite identification to be made. The schist belts appear to be closely associated with the most productive gold zones. In fact, in no instance have I noted gold-bearing gullies or reefs where this schist was not observable.

Large quartz outcrops are numerous throughout the metamorphosed area, but very few have proved to be of an auriferous nature. Numerous creeks and gullies have been worked, but, taken generally, the hard metamorphic rocks have not been nearly so prolific of gold as the more normal beds.

Some micaceous rock, accompanied by a considerable amount of angular quartz, occurs on block No. 37, parish of Korong, and some small, isolated patches were also observed in other parts of the granite area. The field relations point to these being masses of metaphorphic rock which have been let down into the granite magma.

### 4. Pliocene and Post-Pliocene Gravels.

There is little doubt that denudation has been proceeding uninterruptedly throughout the whole Tertiary period, but the only remaining evidence we have of rocks accumulated during that time are the fairly widespread areas of strongly-cemented wash, which are probably of Pliocene age. These consist almost entirely of well-worn quartz pebbles and boulders, strongly cemented together by a siliceous and ferruginous matrix. They represent the remnants of the main water-courses of the period, which seem to have flowed in directions roughly coinciding to the present valleys. (See Plate 7.)

A main branch appears to have come from the south past Maryborough, Golden and Frenchman's Gullies, and junctioned (about the site of the police camp) with a stream coming from the west ; the latter was joined at the Hard Hills by a large tributary which flowed south from Glasgow Hill and across Queen's Gully. The outlet of these leads was apparently in the direction of Wedderburn Junction. They have been largely denuded away by subsequent erosion, the rounded washes on the flanks of Korong Creek, and at Craigie Lead being the re-assorted material derived from them.

The Pliocene wash occurs at altitudes of from 20 to 70 feet above the existing gullies, and has a regular fall of about 20 feet to the mile.

Some high washes occurring at the head of Cup Gully, on Three-Mile Creek, and on the eastern side of the metamorphic rocks, contain an admixture of country rock with the quartz gravels, are more friable than the Pliocene wash, and have a reddish colour. These are evidently younger than the Pliocene, and may be classed as Post-Pliocene.

All these older gravels have been very productive of alluvial gold, and many large nuggets have been obtained from them. Gullies intersecting them have been greatly enriched, and the sloping spurs covered with gravel distributed during the denudation of the original deposit have often been very rich. The leads when *in situ*, have been worked either by shafts or by shallow tunnels, according to their elevation above the surrounding country. The richest yields were obtained either on or in the bedrock, but gold appears to have been frequently obtained for a foot or more into the cemented gravels, in which case it was usually sent to a battery and crushed. According to the late Mr. J. R. Gray,* thousands of tons of cement have been crushed at the different batteries with results that have paid "equally as well as any other branch of mining in the district." Patches of alluvial gold will probably continue to be found in the old leads and their environs for many years to come.

The direction of the main tributary leads is approximately along, and parallel with, the main auriferous belts of rock; the small existing gullies breaking through the lead are at right angles to it. This arrangement has probably tended to confine the alluvial gold within comparatively narrow lateral limits.

### 5. Recent.

Embraced under this heading are the contents of the existing gullies and larger water-courses with their accumulations of shingle and wash derived from the destruction of the older beds and rocks.

Here has been deposited the metalliferous contents derived from a richly auriferous series of rocks, which have probably been undergoing denudation throughout a whole geological period.

It is interesting to note that denudation is at present proceeding more rapidly in the elevated country surrounding the main valleys than in the valleys themselves. Every rain storm transfers tons of material from the hills to the alluvial flats of Korong Creek, but it requires a storm of exceptional magnitude to set the waters of the creek flowing. Even then the general reduction of the gradient of the creek bed has rendered it incapable of transporting more than some of the finer sediments. This silting up will probably continue until the water flowing at the surface of the saturated alluvium has attained sufficient power to cut back a gorge from the lower country near Wedderburn Junction. Just such a process as this has occurred at the gorge known as "The Gulf."

The earlier discovered drifts are now practically exhausted so far as manual working is concerned. The Main Flat has been secured for dredging purposes, one dredge being in operation at the upper end of the flat, near the junction of Nursery Gully. Considerable difficulty was experienced in securing an adequate supply of water, and so far this branch of mining has met with only moderate success.

There is no record of the approximate total amount of alluvial gold taken from the Wedderburn field, but it must have reached a large amount. Fortunately the late Mr. J. R. Gray has compiled a list of the chief nuggets and their localities, which I give below.

I have endeavoured to fix accurately the exact position of these nuggets on the map of the gold-field which accompanies this report.

### List of Nuggets over 50 oz. in Weight.

Wedderburn Gold-field.

| No. of Nuggets. | Date | Finder. | Weight in Ounces. | Locality. |
|---|---|---|---|---|
| 1 | 1853 | James Bangery ... ... ... ... | 96 | Potter's Hill |
| 1 | 1854 | T. W. Cosh ... ... ... ... | 144 | Possum Point |
| 1 | 1854 | — Firth ... ... ... ... | 77 | Welshman's Point |
| 1 | 1854 | Jas Rogerson ... ... ... ... | 96 | Steel's Gully |
| 1 | 1856 | John Hassett ... ... ... ... | 255 | Potter's Hill Gully |
| 1 | 1857 | — Jessup ... ... ... ... | 73 | Ironbark Gully |
| 1 | 1857 | Jas. Lubbock ... ... ... ... | 72 | Snow's Gully |
| 1 | 1858 | Jas. Pretty ... ... .. ... | 71 | Bocca Flat |
| 1 | 1858 | John Harton ... ... ... .. | 55 | Long Gully |
| 1 | 1859 | — — ... .. ... ... | 192 | Ironbark Gully |
| 1 | 1859 | F. Gallyer ... ... ... ... | 192 | Italian Point |
| 1 | 1859 | Jno. Harton ... ... ... ... | 82 | Judy Point |
| 1 | 1859 | — Sanders ... ... ... ... | 51 | Peep o' Day |
| 2 | 1860 | Jno. Finn ... ... ... ... | 55 each | Finn's Flat |
| 1 | 1860 | George Dupuy ... ... ... ... | 55 | Tin Pot Gully |
| 1 | 1862 | H. Presnell ... ... ... ... | 75 | Bocca Flat |
| 1 | 1863 | Trotman, Hayes ... ... ... ... | 55 | Judy Point |
| 1 | 1866 | Philip Archey ... ... ... ... | 114 | Main Flat |
| 1 | 1868 | Riley and Murphy ... ... ... | 150 | Ironbark Gully |
| 1 | 1876 | T. Linkleter ... ... ... ... | 70 | — — |
| 1 | 1889 | Costo Cellevich ... ... ... ... | 336 | Possum Point |

*Wedderburn Gold-field, p. 9.

The 22 nuggets above enumerated had a total weight of 2,376 oz., but they must represent but a small proportion of those actually obtained. During the main gold rush, according to some of the pioneers, it was a risky proceeding even to inquire if a miner had obtained gold. The largest nugget on the list was found by a "new chum" Italian as lately as 1889, in some shallow redistributed Pliocene wash on a flat spur near Harrison Cook's house. The present valley, having cut away the old lead, has disseminated this wash over a fairly large area, and it is quite possible that further alluvial gold will be discovered in the vicinity. It is as likely to be found in and under the shallow rock-bars as in the small flat gullies crossing the line of the old lead.

In a report* made in 1888, Mr. E. J. Dunn gives a list of nuggets found at Potter's Hill, and shows their position on the plan here reproduced. He gives most of the weights in pounds, but for convenience of reference they are given below as ounces :—

| Position on Plan— | |
|---|---|
| 1 ... ... ... | 180-oz. nugget. |
| 2 ... ... ... | 96-oz. nugget. |
| 3 ... ... ... | 204-oz. nugget and 72-oz. nugget. |
| 4 ... ... ... | 270-oz. nugget. |
| 5 ... ... ... | 336-oz. in small pieces. |
| 6 ... ... ... | 72-oz. nugget, 28-oz. nugget. Other pieces, making 170 oz. in all, from Reach's claim, measuring 10 feet by 10 feet. |
| 7 ... ... ... | 84-oz. nugget. |
| 8 ... ... ... | 336-oz. nugget (net weight, excluding quartz). |

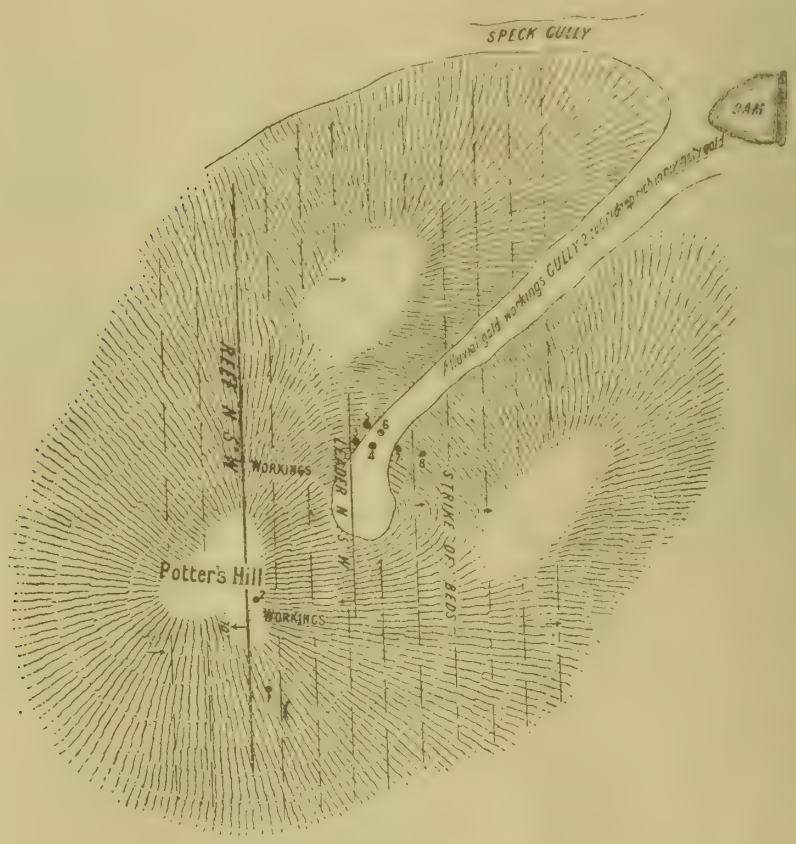



Fig. 1.

Plan showing the position of nuggets found at Potter's Hill.

There is always a possibility of new auriferous alluvial gullies being found in the vicinity of Wedderburn. There are scores of gullies, also Pliocene (cement) patches, both north and south along the strike of the auriferous belt, in which only an occasional hole has been sunk. Gold could be very easily missed in this way, as continuous "leads" do not, as a rule, occur at Wedderburn, the gold being mostly in patches, separated by poor or unpayable ground.

## THE INDICATORS.

The name "Indicators" was given to certain beds because it was at an early date recognised that they were closely associated with the occurrence of rich patches of gold in the quartz reefs; in fact, they were regarded as "indicating" where that gold should be looked for. Subsequent quartz mining has fully justified the opinion that they have been a leading factor in the deposition of gold. These indicators are undoubtedly sedimentary beds, interstratified with and forming part of the Ordovician series.

* Rept. Min. Reg., 31st Dec., 1888, p. 67.

In colour they range from dark blue to almost black, contrasting strongly with the lighter colour of the surrounding strata. They are easily picked up, and can be traced practically throughout the length of the goldfield. In numerous sections (Plate 3, Fig. 2, Plate 4, Fig. 1) they can be observed folded into anticlines and synclines. It was assumed from the dark appearance of these bands that they contained carbon, and it was partly to ascertain if this was a fact that numerous samples were submitted for analysis. It will be seen from the tabulated results on page 14 that the carbon contents is considerable, ranging from 0·19 per cent. to 0·39 per cent. With reference to these Mr. Bayly says, "By experience the amount of carbon present can be approximately determined from inspection of the material."

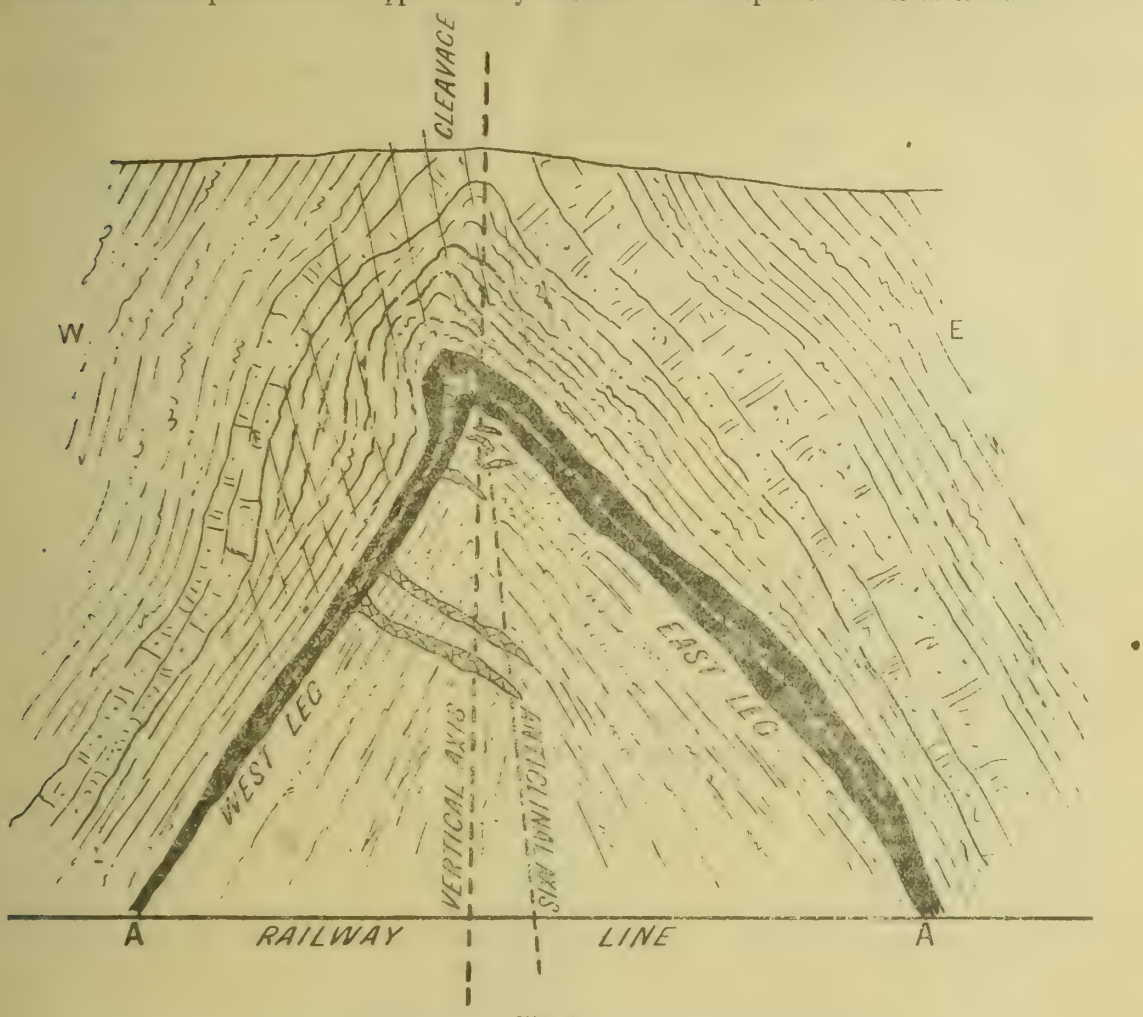



Fig. 2.

An "indicator" bent into an anticline. Railway cutting, Wedderburn. Scale, 3 feet to 1 inch.

The action of carbon as an agent in the precipitation of sulphides and gold from solutions has long been known ; in nature we recognise its action in the throwing down of "bog iron" deposits, and our lignite and coal seams are permeated with iron sulphide. It is also commonly used in the laboratory ; and in metallurgical processes it is used in the form of charcoal to precipitate gold from cyanide solutions.

When we recognise the fact that these carbon-bearing strata have during the whole period since their deposition been opposed to circulating solutions containing gold and other metals, it is not astonishing that we find points of enrichment along their contact, with the fissures (quartz lodes) in which the solution circulated.

It is highly probable that the first action of the indicator was a general one, during which period zones surrounding them were enriched at the expense of the beds in which the carbon content was poor or absent. The period during which the rich pockets of gold were deposited was distinctly subsequent to this action, and occurred during the secondary system of faulting.

The gold-bearing solutions evidently circulated along the fault planes and in the indicators themselves. Any one observing the indicators cannot help being impressed with the fact that the very great majority of them have a small quartz vein running through them parallel with the stratification ; sometimes it is on or near the walls, but more often it is near the centre of the bed. The number of times that this occurs in the carbon-bearing beds is out of all proportion to their percentage in the general rock-mass, and it is evident that there is something inherent in these beds which causes them to become planes along which minor rock movements take place. It is quite possible that some of the carbon may have crystallised out as graphite, thus forming a lubricant which would assist movements along these beds, or it may have been caused by the chemical alteration of some of the constituents.

The quartz formed on these slide-planes is distinctly metasomatic, and, as a rule, does not exceed half-an-inch in thickness. In exceptional cases, however, as at Edwards' reef and Baker's reef (30 feet west of Lane's reef), it has reached from 6 inches to 12 inches in thickness. I have not noticed one instance (and I think this may be accepted as a guiding rule) of an indicator producing rich pockets of gold where this metasomatic quartz is absent. These quartz veins are generally iron stained, indicating that they are probably charged with sulphide ores at a depth. (See Plates 12 and 19, and fig. 5.)

Of the 27 samples of indicators free from quartz submitted to Mr. Bayly for examination none was found to be non-auriferous, the results ranging from a trace to 1 oz. 2 dwts. 9 grs. per ton of sample. This is a most important result, as the greatest care was taken to select specimens removed from the influence of secondary (and probably auriferous) quartz veins. The richest sample was particularly free from any such influence, and is a most interesting rock. The finest parings can be taken from this with a knife, and these when washed give free gold. Interspersed through this indicator are however, numerous nodules of a secondary, ferro-magnesian mineral. Interesting tests for the extraction of this gold are given on p. 26.

It may then be accepted as proven that gold exists in the indicators themselves apart from the quartz veins associated with them, and that probably a secondary enrichment has taken place along, or by means of, the indicator slides, along which the metasomatic quartz has formed.

## Assays of Indicators and Auriferous Slates.

| — | Assay No. | Locality. | Per Ton of Sample. Gold. oz. dwt. grs. | Silver. oz. dwt. grs. |
|---|---|---|---|---|
| 1905 | 488* | Gouge's claim, north of Wedderburn | Trace | Nil |
| | 489* | Golden Bars mine | Trace | Nil |
| | 707* | Edward's reef | Trace | Nil |
| | 708* | The Champion reef | 0 1 0 | 0 0 9 |
| 1906 | 1* | North face, Baker's mine | 0 0 3 | .. |
| | 2* | Baker's mine | 0 0 8 | .. |
| 1907 | 575* | Cut on Edward's reef | Trace | .. |
| | 631 | T. Olive's shaft | Trace | .. |
| | 632 | Edward's reef | Trace | .. |
| 1908 | 231* | Edward's workings | Trace | Nil |
| | 236* | From fold on south end of the Eclipse line | Trace | Nil |
| | 238* | Auriferous slate, Queen's Gully line of reef | 1 1 13 | 0 3 9 |
| | 239* | Auriferous slate, Queen's Gully line of reef | 0 15 16 | 0 1 2 |
| | 279* | Brockwell's prospecting shaft, south of Nine-mile road | Trace | Trace |
| | 281* | Shaft, 230′ west of mouth of Gray's tunnel, Potter's Hill line of reef, depth 44 ′ | 0 0 16 | 0 1 5 |
| | 288* | Three chains west of Lemon's house, near the railway cutting | Trace | .. |
| | 289* | Just north of Brockwell's shaft, Potter's line of reef | Trace | .. |
| | 290* | 150′ east of the Eclipse line, Gouge's workings | Trace | .. |
| | 293* | Shaft, Edwards' workings | Trace | .. |
| | 295* | Indicator with quartz veins, Leech's paddock, township of Wedderburn | Trace | .. |
| | 297 | Leech's shaft, 20′ | Trace | |
| | 296 | Leech's shaft, 30′ | 0 10 0 | 0 2 18 |
| | 300 | Leech's shaft, 30′ | 0 1 7 | .. |
| | 301 | Leech's shaft, 80′ | 0 1 7 | .. |
| | 298 | Leech's shaft, 100′ | 0 1 23 | 0 0 16 |
| | 299 | Leech's shaft, 110′ | 0 14 0 | 0 2 15 |
| | 331 | Leech's claim | 1 2 9 | 0 1 19 |

* See table of analyses.

## Analyses of Indicators and Auriferous Slates.

| — | No. | 488. (05). | 489 (05). | 707 (05). | 708 (05). | 1 (06). | 2 (06). | 575† (07). | 231 (08). | 236 (08). | 238 (08). | 239 (08). | 279 (08). | 281 (08). | 288 (08). | 289 (08). | 290 (08). | 293 (08). | 295 (08). | — |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | .. | 47·04 | 47·12 | 59·28 | 58·66 | 65·29 | 63·74 | 59·90 | 70·62 | 67·80 | 65·80 | 67·90 | 64·70 | 67·49 | 64·97 | 68·58 | 66·58 | 74·16 | 64·01 | $SiO_2$ |
| $Al_2O_3$ | .. | 33·90 | 31·56 | 27·24 | 23·26 | 20·26 | 19·91 | 25·10 | 17·59 | 18·46 | 19·35 | 18·23 | 20·28 | 19·61 | 17·24 | 18·02 | 17·29 | 15·44 | 21·36 | $Al_2O_3$ |
| $Fe_2O_3$ | .. | 1·40 | 5·76 | 0·10 | 4·28 | 2·63 | 4·07 | 0·85 | 0·84 | 1·40 | 1·96 | 1·40 | 2·67 | 1·89 | 2·29 | 1·61 | 3·33 | 0·77 | 1·19 | $Fe_2O$ |
| FeO | .. | 0·34 | 0·21 | 0·11 | 0·38 | 0·23 | 0·45 | 0·13 | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | FeO |
| MgO | .. | *(1.58) | 1·39 | 1·16 | 2·41 | 1·49 | 2·10 | 2·31 | 0·77 | 1·08 | 0·97 | 1·08 | 1·15 | 0·86 | 0·94 | 0·83 | 0·70 | 0·87 | 1·16 | MgO |
| CaO | .. | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | CaO |
| $Na_2O$ | .. | 0·76 | 0·51 | 0·31 | 0·49 | 0·35 | 0·55 | 0·58 | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | $Na_2O$ |
| $K_2O$ | .. | 6·02 | 4·56 | 2·17 | 3·44 | 2·03 | 3·89 | 5·12 | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | $K_2O$ |
| $H_2O+$ | .. | 7·45 | 7·73 | 6·58 | 5·60 | 5·11 | 4·49 | 5·60 | 5·40 | 4·02 | 4·17 | 3·92 | 4·07 | 4·54 | 4·51 | 4·31 | 4·51 | 3·05 | 4·36 | $H_2O+$ |
| $H_2O-$ | .. | 0·43 | 0·56 | 0·45 | 1·02 | 0·45 | 0·47 | 0·46 | 0·31 | 0·94 | 0·49 | 0·48 | 0·85 | 0·60 | 1·28 | 1·00 | 0·73 | 0·45 | 1·12 | $H_2O-$ |
| $TiO_2$ | .. | 1·08 | 1·08 | n.d. | 0·97 | 0·85 | 0·79 | 0·96 | 1·50 | 1·58 | 1·75 | 1·75 | 1·45 | 0·85 | 2·00 | 2·50 | 1·00 | 0·60 | 0·70 | $TiO_2$ |
| $P_2O_5$ | .. | Trace | Trace | Nil | Nil | Trace | Trace | Trace | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | $P_2O_5$ |
| $SO_3$ | .. | Nil | Trace | 0·26 | Trace | Trace | Nil | Trace | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | $SO_3$ |
| Cl | .. | Trace | Trace | 0·99 | Trace | 0·27 | 0·11 | Trace | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | Cl |
| C | .. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | n.d. | 0·33 | 0·40 | 0·32 | 0·40 | 0·32 | 0·39 | 0·19 | 0·23 | 0·37 | 0·35 | 0·29 | C |
| | | 100·00 | 100·48 | 98·65 | 100·51 | 98·96 | 100·57 | 101·01 | 95·36 | 95·68 | 94·81 | 95·16 | 95·49 | 96·23 | 93·42 | 97·08 | 94·51 | 95·69 | 94·19 | |
| Less O=Cl | .. | .. | .. | 0·22 | .. | 0·06 | 0·03 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Total | .. | 100·00 | 100·48 | 98·43 | 100·51 | 98·90 | 100·54 | 101·01 | 95·36 | 95·68 | 94·81 | 95·16 | 95·49 | 96·23 | 93·42 | 97·08 | 94·51 | 95·69 | 94·19 | |
| Gold per ton | | Trace | Trace | Trace | dwt. grs. 1 0 | grs. 2 | grs. 8 | Trace | Trace | Trace | oz. dwt. grs. 1 1 13 | 15 | dwt. grs. 16 | Trace | dwt. grs. 0 16 | Trace | Trace | Trace | Trace | Trace |
| Silver per ton | | Nil | Nil | Nil | 0 9 | 3 | 5 | .. | Nil | Nil | 0 3 9 | 1 | 2 | .. | 1 5 | .. | .. | .. | .. | .. |

*Magnesia by difference. † $CO_2$, nil.

## Notes on the Analyses.

The samples analyzed were all soft indicator slates, free from quartz veins.

Nos. 279, 281, 288, 289, 290, 293, and 295.—These were indicator slates, consisting of grey and black bands. The black portion was separated from the rest for complete analysis, including carbon. The ferrous iron and alkalies were not determined. It was found that the amount of carbon present may be estimated from the colour of the sample.

No. 575.— During analysis a small amount of carbonaceous matter was indicated, and is included in $H_2O$ + (water given off at temperatures above 100° C.).

Magnesia is present in all samples analyzed, and lime is absent.

Sulphur is absent, or occurs only as a trace, so that the gold is evidently not associated with pyrites.

These analyses should be compared with that of the clay on page 8.

## FAULTS.

The Wedderburn beds have been faulted and fissured to a remarkable degree. Scarcely a section can be examined without evidence of this being apparent.

The faults may be classified in two main divisions, the "slides" and the "cross-courses." The former may again be separated into two divisions, "normal slides" in which the beds on the hanging wall roof of the slide have apparently subsided (Fig. 3);

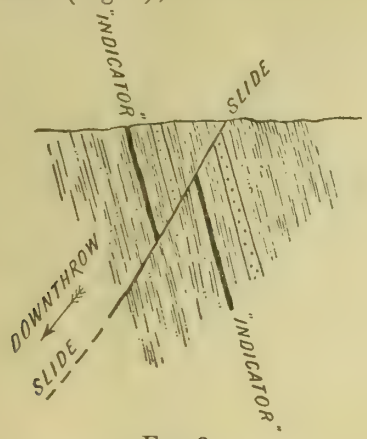



Fig. 3.
Section of Normal Slide.

and the "reversed" slides in which the hanging wall beds have apparently been forced upwards or above the beds below the slide (Fig. 4.)

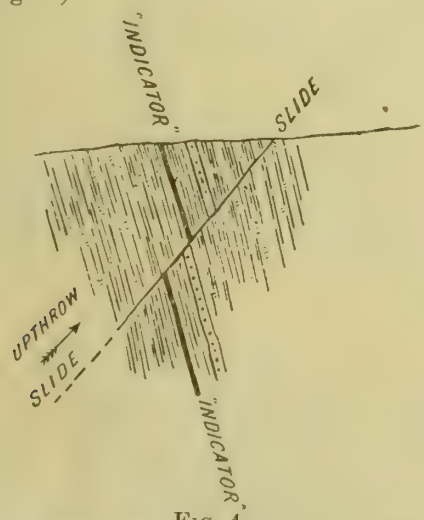



Fig. 4.
Section of Reversed Slide.

The latter type of slide was probably first formed at the time of the folding of the beds, but has since been the plane along which numerous subsequent movements have taken place

The normal slides do not always intersect the beds at the angle shown in section, but sometimes conform to the stratification; in this case they are generally minor faults and occur more numerously in the indicators than in any other strata. The types of slide shown in the above sections are those usually associated with the rich gold occurrences such as Shaw's, Potter's Hill, Champion, &c.

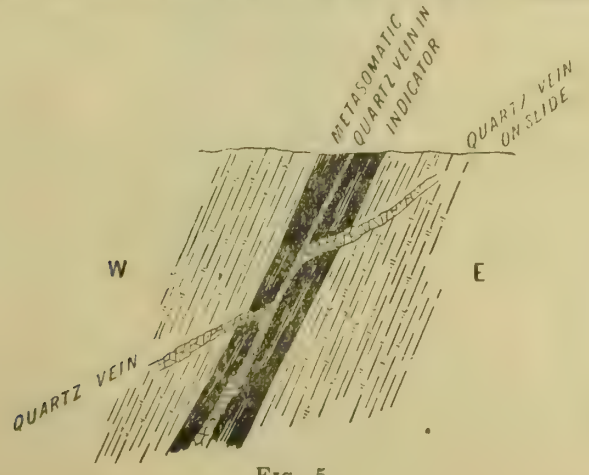



Fig. 5.
Quartz Veins on Slides, McKinnis's Gully (Section).

A fairly common occurrence is exhibited in Fig. 5, where a slide cutting across the beds has been faulted and moved for about 2 feet by a subsequent slide conforming to the bedding. Each has been filled with a quartz vein. Such junctions are generally favorable to the production of gold-bearing patches.

The strike of both "normal" and "reversed" slides nearly always approximates to the strike of the beds, generally occurring as a crescent, the chord or chords of the arc being the strike of the strata.

The cross-courses are less numerous than the slides and are of more recent origin than the main quartz reefs and slides, though probably approximately contemporaneous with the formation of the laminated quartz veins.

The cross-courses are usually accompanied by a dyke.

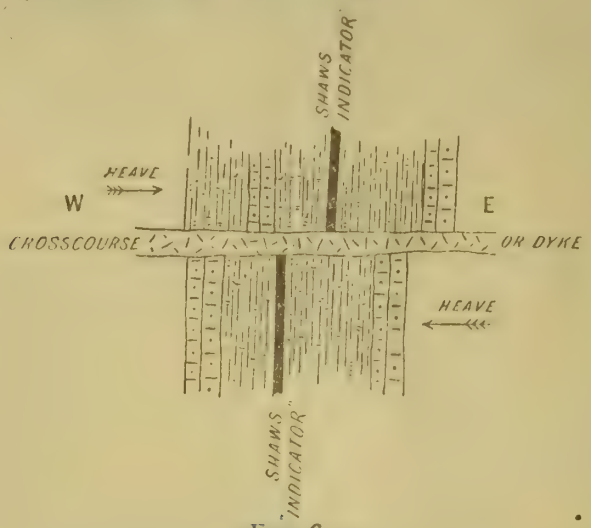



Fig. 6.

Section of Cross-course, Shaw's Mine.

The above section, although the heave was only a couple of feet, is typical of the general mode of occurrence of the cross-courses.

A combination of both slides and cross-course is shown in the plan and section of the Champion mine. Plate 16.

An interesting section showing several of these cross-courses subsequently faulted by a slide was exhibited in the dredge workings opposite the Royal Hotel (Fig. 7).

In this section the Specimen Hill reef is formed on a strike fault that has also acted as a cross-course, as far as the original cross-course dykes are concerned. I think, however, that this movement has been a subsequent one along the original fault plane, as I have observed no other similar instance. In this case it is interesting to note, however, that quartz has formed along the fault planes, proving its age to be younger than that of the dykes.

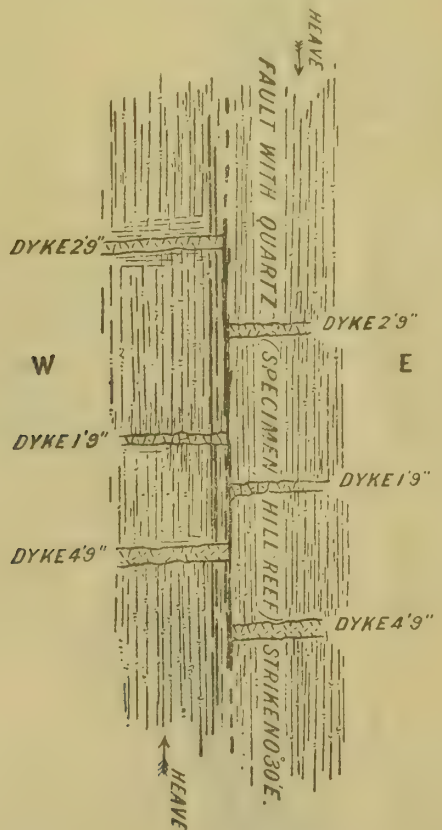



Fig. 7.

Ground plan of Dredge Floor, Wedderburn, Opposite Royal Hotel.
Scale, 20 feet to 1 inch.

Numerous indicators have been faulted and lost by means of cross-courses, frequently in close proximity to the rich gold-bearing veins, as in the case of Shaw's rich patch, the Enterprise line of reef, and others. It should, therefore, prove of value to miners to point out that the faulted indicator, or reef, may be looked for with confidence in the direction of the larger angle formed by the intersection of the indicated and the cross-course. In such cases the cross-course should be passed through, and driving should be kept in the blank ground on the side opposite to the worked ground, as in the annexed sketch, Fig. 8.

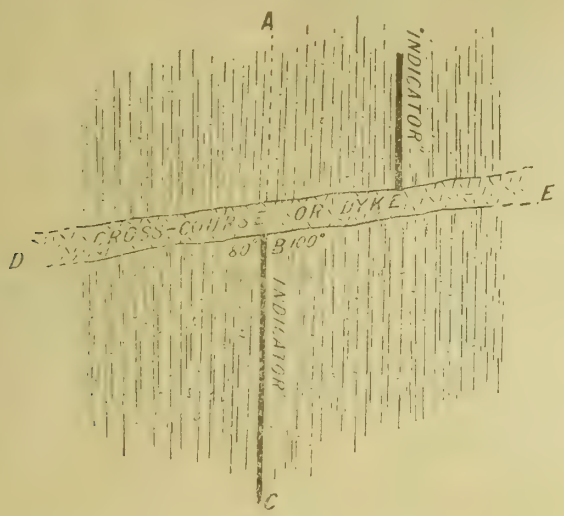



Fig. 8.

Indicator Faulted by a "Cross-course"

In this instance, in driving from C towards A, the indicator is found to be faulted at B. By measurement the angle CBD is found to be 80, and the angle CBE 100. Therefore, the cross-course should be passed through towards A, and driving continued along the wall of the cross-course, towards E, until the faulted indicator is intersected.

The fracturing caused by the movement of the hanging wall country—coupled, most probably, with the fissuring produced by wedge-shaped masses of rock being crushed between two or more adjacent slides—has been the direct cause of the production of channels in which the large masses of stockwork veins, which are such a noticeable feature of the Wedderburn field, have been formed. The slide-planes themselves are usually filled by quartz veins.

## DYKES.

Prior to this survey dykes do not appear to have been recognised as such. By the miner they were recognised in their relation to the faulting of the reefs or indicators, but their igneous nature was apparently not suspected. In fact they seem to have constituted the miner's *bête noir* on this field. I have quite frequently heard the expression, "We were on good gold, when the indicator was cut off by a cross-course," and very frequently this has meant the end of the mine. In some instances, as at the Champion mine and at Baker's Creek on Shaw's line of indicator, the country has been picked up on the opposite side of the dyke, but at other points, as the Enterprise reef and north of Shaw's rich patch, the belts or lodes on the opposite side do not appear to have been correlated.

The rule given under the heading of "Faulting" for finding the dislocated parts of lodes could be profitably applied here.

There is no essential reason why the dykes should fault the lodes, and it is possible that in many cases they have not done so, the width of the dyke being sufficient in itself to bar the progress of the miner. In some instances, however, the heave has been considerable, 16 feet being recorded at the Champion mine, and approximately 120 feet on Shaw's line.

There is no doubt that dykes occur very numerously throughout the gold-field, those shown on the map probably representing but a small proportion of the whole. The country rock is for the most part highly decomposed, but the dykes are more so, and it is only where they have been cut by mining works that they can be located. Along the Shaw's-Potter's Hill belt of country I have recorded nine separate dyke outcrops. With two exceptions, (Ford's and McKinnis's) they all appear to decompose to buff-coloured clays containing dark patches, and in appearance closely resemble the auriferous dykes of the Walhalla-Wood's Point belt of country.

Ford's dyke, one of the exceptions mentioned, has decomposed to a white, cheese-like and very friable clay, studded with large crystals of biotite mica, and is closely associated with an auriferous reef. In the other instance there are two parallel dykes, running from the head of McKinnis's gully towards the head of Little Ironbark; this is similar to Ford's except that the mica is absent. The presence of a dyke is frequently denoted by the occurrence of carbonate of magnesia at the surface.

Nearly all the recorded dykes run approximately east and west, at or nearly at right angles to the strike of the strata; but along the belt crossing the railway cutting they appear to follow nearly the same line of strike as the sedimentary rocks. I have no definite evidence that these intrusions of igneous matter have affected the enrichment of the quartz-reefs, but I am, personally, strongly of the opinion that such has been the case. To my mind it is more than a coincidence that dykes should be found in close association with the indicators from which rich patches or alluvial gold have been obtained, such as Italian Point, Judy Point, several points on the Eclipse line, One Tree Hill, numerous points along the Shaw's, Potter's Hill, and Enterprise Belt, Campbell's Reef, south end Lane's Reef, Ford's Reef, Edwards' Reef, &c.

In my opinion the dykes have a twofold connexion with the production of gold. The first is mechanical; there is ample evidence that they have faulted the beds to a considerable degree, and incidentally have produced minor slide planes, thus giving rise to channels along which secondary solutions could flow. The second is chemical; the superheated steam with which they were saturated has acted directly on the indicators, and, as a final stage of magmatic secretion, they have probably given off such highly mobile and solvent constituents, as chlorine, fluorine, &c.

In connexion with this question, it is interesting to observe the experience at Ballarat, where the indicator and fault occurrences are analogous to those of Wedderburn, although the dykes are less numerous. Mr. E. Lidgey, in speaking of these dykes, says—"One is noticed in the Sulieman Pasha mine, varying in thickness from a mere thread to four feet, usually about two feet thick, considered by the miners to have a direct influence on the auriferous character of the quartz."* At a later period Professor J. W. Gregory states†:—"The 'pug' (Last Chance mine) is a felsite dyke. . . . . It varies in thickness from 3 inches to 2½ feet. The quartz veins traversing the country rock end off abruptly against it, and at their junction is found nuggety gold."

The width of the Wedderburn dykes appears to vary from 2 feet to 10 or 15 feet.

The dykes do not as as a rule appear to contain secondary veins of quartz, but I have observed lenticular bulges to occur in the dyke in Holloway's tunnel (Hard Hill), and in the Baker's Creek dyke.

Seven samples of dyke were forwarded to the laboratory for assay. These, like the indicator, were carefully selected, so as to be as far removed as possible from known auriferous veins, and were free from secondary quartz. The result is a trace of gold in each instance; this is most important, and indicates that the dykes are worth more attention from the miner than they have yet received.

ASSAY OF DYKE SAMPLES, WEDDERBURN.

| Field No. | Laboratory No. | Locality. | Gold per Ton. |
|---|---|---|---|
| | 1908. | | |
| 25 | 276 | Railway Cutting, Wedderburn Station ... ... | Trace |
| 26 | 277 | Enterprise Reef ... ... ... ... ... | Trace |
| 28 | 278 | Potter's Hill line of reef, near Nine Mile Road ... | Trace |
| 30 | 280 | Potter's Hill line of reef, shaft on Nine Mile Road, 54 feet deep... ... ... ... ... ... | Trace |
| 40 | 286 | Reef in Queen's Gully, 100 yards W. of Lane's Reef Line | Trace |
| 49 | 292 | 3 ch. N. of N.E. corner of Block 11, Section VIII. P. of Wedderburn ... ... ... ... ... | Trace |
| 51 | 294 | Railway Cutting, Wedderburn Station ... ... | Trace |

## THE QUARTZ REEFS.

One of the striking features of the Wedderburn gold-field is the profusion with which quartz is distributed over its surface. This is no doubt due, in many cases, to the wearing down of flat quartz spurs and leaders, which are, approximately, parallel to the surface contours.

In numerous instances, however, such as at White Rock Hill, Quartz Hill, Big Hill, Hermit Hill, and many other places throughout the metamorphic area, there occur large lode-like bodies of amorphous quartz. These attain a width of upwards of 25 feet, and are known to the miners as "buck-reefs," from the fact that they are never auriferous in the main mass. These large bodies of quartz have apparently been formed along strike faults, and may be traced for considerable distances. Should this class of reef conform to the bedding of the enclosing Ordovician rock (Fig. 8) clean walls are produced without the accompaniment of any great number of quartz spurs; should they dip across the bedding, however, (as in Lane's reef, Plate 12 and Fig. 10) numerous spurs ramify into the hanging wall country and produce what may be termed "quartz-breccias."

* Report on the Ballarat East portion of Gold-field, p. 9, E. Lidgey, Spec. Rept. Dept. Mines, Vict., 1891.

† The Ballarat Gold-field, p. 27, J. W. Gregory, Mem. Geol Surv., Vict., 1907.

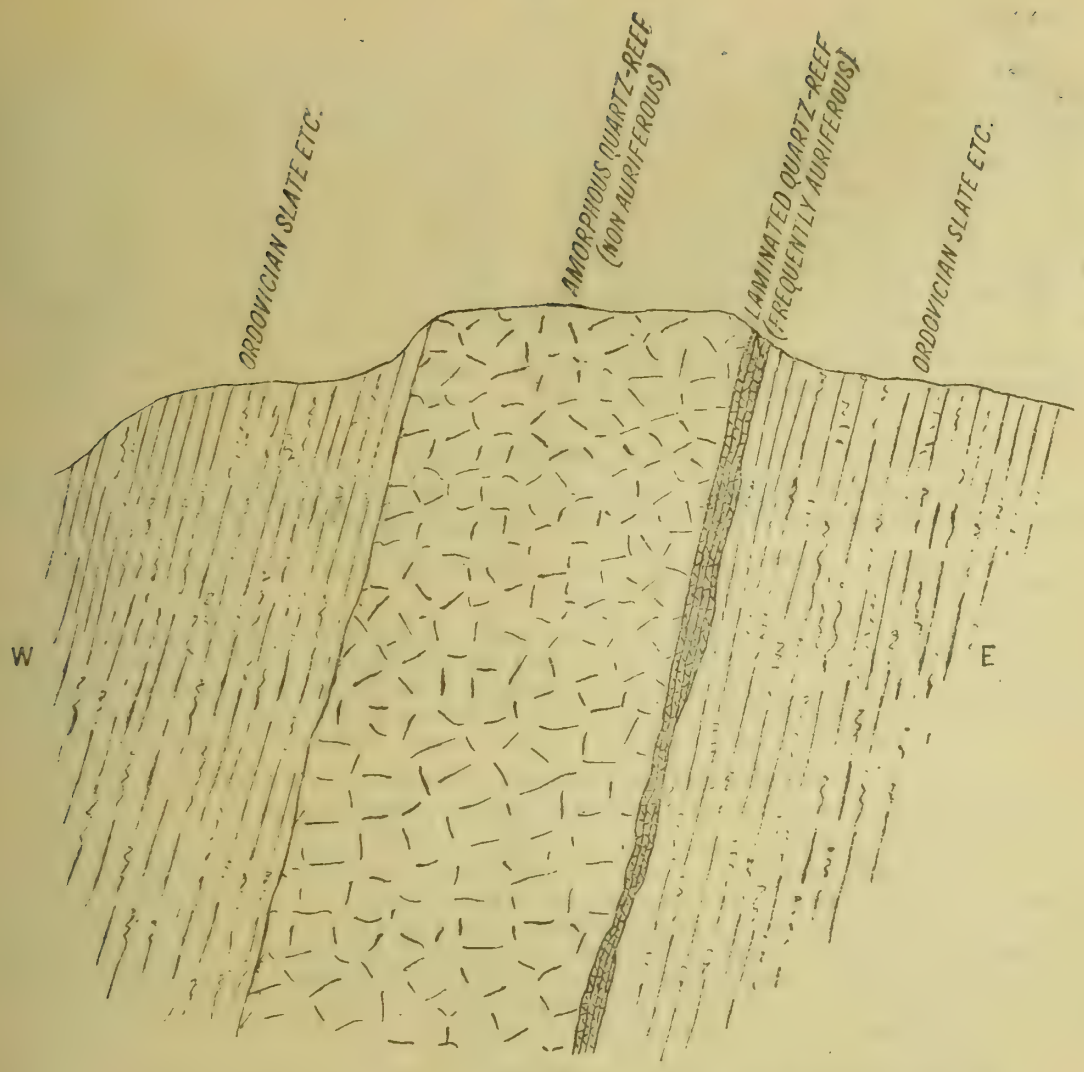



Fig. 9.
**Diagram to illustrate section of large quartz reefs occuring at White Rock Hill, Quartz Hill, &c.**
Scale about 10 feet to 1 inch.

At the base (or footwall) of these amorphous quartz bodies (Figs. 9 and 10) small laminated quartz reefs have frequently been formed. These are distinctly subsequent in age, and may be recognised by their bluish colour and lamination. They are not as a rule continuous for long distances, and they vary rapidly in width; in many cases they may be seen as a mere thread, and a few feet away may swell to 18 inches or more. in width.

It is these secondary laminated quartz bodies which form the payable auriferous reefs of the Wedderburn field, apart from indicator occurrences. Typical instances are the Lane's reef and Specimen Hill reefs.

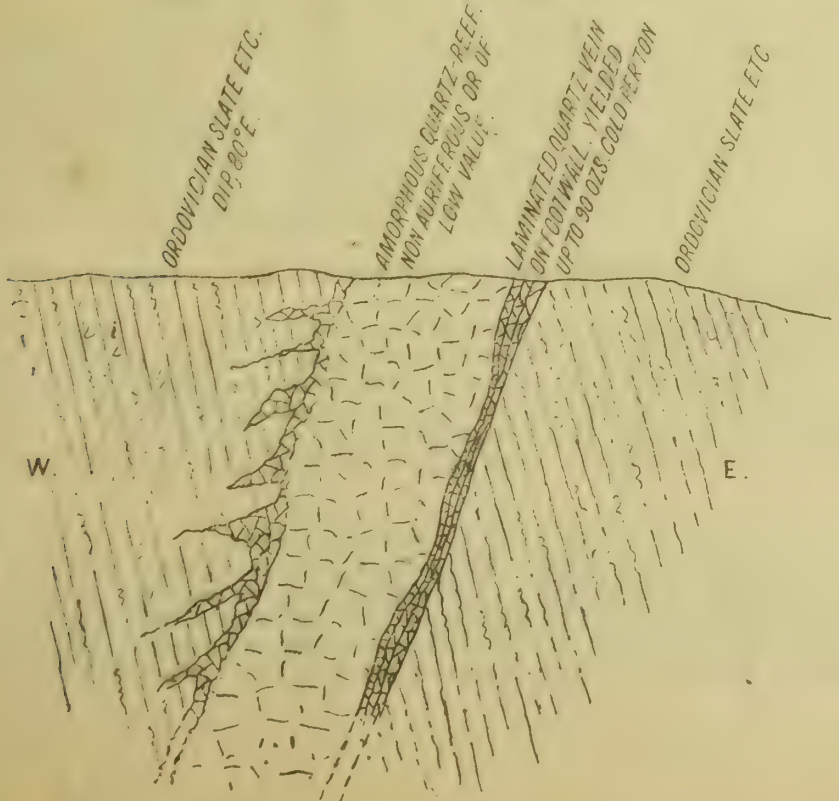



Fig. 10.
Transverse section of Lane's Reef. Scale, 5 feet to 1 inch

Reefs formed on the bedding planes are not common on this field, but in three instances, viz., Canadian Reef (Plate 13, and Figs. 12 and 13), Baker's Reef (Plate 12), and Edwards and Symon's Reef (Plate 17 and Plate 5, Fig. 1), payable shoots of gold have been worked in reefs of this description.

The great mass of the quartz is derived from the "stockwerk" veins, which everywhere seem to intersect the beds. These occur as bunches and leaders of quartz ranging from an inch or so to several feet in thickness. Certain belts with an approximately meridional strike seem to be more productive of quartz than adjacent beds, but no apparent law governs their occurrence. They may be considered as more or less horizontal bodies of quartz of uncertain thickness and length, occupying spaces or fractures produced in the Ordovician rocks from the time of their uplifting from the sea bed, through all the great tectonic movements which folded them and the subsequent fracturing and faulting to which they have been subjected.

It is at the intersection of these flat veins and spurs (more especially when associated with subsequent faulting) with the bands of indicator slate that the rich patches of gold occur.

## GOLD OCCURRENCES.

Gold deposition in the Wedderburn rocks appears to have been, in most cases, essentially a process of precipitation along favorable points of contact of the secondary quartz lodes and the indicator beds.

We do not see in this field (as in its prototype, the Ballarat East gold-field) large bodies of low grade quartz, which have proven economically payable.

It is estimated that two-thirds of the gold obtained on the Ballarat East gold-field came from the large formations and spurs apart from the indicators, and one-third from the points of enrichment along the lines of indicator. So far as mining has progressed, this has certainly not been the case at Wedderburn. It is safe to assert that, apart from such reefs (fissure or fault-lodes) as Lane's and Specimen Hill reefs, nine-tenths of the reef gold has come from direct contact of the reefs with the indicators.

It is apparent that the payable gold has been deposited along lines of secondary drainage subsequent to the formation of large quartz reefs, such as White Rock Hill, Quartz Hill, &c.

To my mind, it is highly probable that the great bodies of silica, together with their mineral contents, were introduced into the Ordovician rocks as the acid product representing the final stage of the intrusion of plutonic matter. The first crystallisation of quartz was a rapid one, resulting in the deposition of amorphous reefs such as outcrop on White Rock Hill, Quartz Hill, &c., and which, from an economic point of view, are non-auriferous. With each successive crystallisation of quartz, the silicious residue became increasingly aqueous and mobile from the presence of such elements as chlorine, boron and fluorine This aqueo-silicious residue probably contained, in concentrated form, nearly the whole of the mineral matter introduced during the plutonic phase.

The final stage of silicious crystallization included the precipitation of the gold and the sulphide contents along the more recent fault channels, and even in the indicators themselves, along the lines of metasomatic alteration.

The last formed quartz bodies are usually blue in colour and laminated.

The production of the gold solvent, ferrous-sulphate, by the decomposition of iron pyrites in water excluded from the air, has probably, as a final stage, aided the production of the rich gold patches.

I do not think there need be any anxiety as to the auriferous nature of the indicators below water level. The conditions of the Ballarat East indicator belt are practically analogous to those of Wedderburn, and on that field they have been profitably worked below 1,000 feet.

### The Mines in the Unaltered Ordovician Series.

With reference to the yields of gold given below in connexion with the descriptions of the reefs, I wish to state that I have quoted freely from an excellent little pamphlet published locally, entitled *The History of the Wedderburn Gold-field*, by the late Mr. J. R. Gray (Pioneer), with an appendix dealing with mining between the years 1890–1905 by Mr. C. R. Goode, late proprietor of the *Wedderburn Express* newspaper. The late Mr. Gray was associated with the Wedderburn gold-field from its inception, and throughout his life was a continuous investor in its mining ventures. As a business man and a gold-buyer he was in close contact with all the miners on the field, and is reported to have immediately recorded all yields and crushings as they occurred. His notes may therefore be accepted as the most reliable information extant with regard to the gold yields.

Where possible, I have obtained battery or mint returns of gold, and included these in the respective reports of the mines.

The work of examining the various shafts was extremely arduous, and attended with not a little danger. Scores of shafts, varying up to 100 feet in depth, many of them sunk thirty or forty years ago, had to be descended by means of a rope, or without a rope by means of niches cut in the walls ; and it was no uncommon experience to examine several without gathering any information worth recording.

In five instances, viz., Lane's Reef, Little Wonder Reef, Specimen Hill Reef, Campbell's Reef, and the Victory Reef, shafts have been sunk below water level ; in all other cases the workings are above water level.

### The Eclipse (Victoria) Reef.

This reef is situated near the south end of the field, about $1\frac{1}{4}$ miles from the township. It was opened in 1888 by Mr. S. Chadwick. It is approximately, on the same line as the Champion, and has been the source of several runs of alluvial gold. The indicator on this reef is supposed to be a small band of rock containing oxide of iron. Indicators of the carbon-bearing type are not apparent where the reef is worked, but can be seen a few chains east of the line. (Plate 21, Fig. 3.)

The gold was obtained in some fairly large leaders following a schistose band of rock highly charged with blebs or nodules containing a ferro-magnesian mineral. The amount of alluvial gold which has come from this line of country indicates that it is worth further attention. The deepest workings are 60 feet from the surface, but the gold obtained all came from a higher level. The following crushings are recorded :—

| | Tons. | Yield. |
|---|---|---|
| | 12 | 89 oz. |
| | 23 | 17 oz. |
| | 26 | 3 oz. 17 dwt. |
| Recorded specimens | | 6 oz. |
| Total | 55 | 115 oz. 17 dwt. |

### Shaw's (Caledonia) Reef.

This is situated about 1½ miles to the west from Wedderburn, and is upon a well-defined line embracing Potter's Hill, Holloway's, and the Enterprise reefs, from which a large amount of both alluvial and reef gold has been obtained. The conditions are essentially those of the indicator type. (Plate 10.)

Two lines of indicator occur and both have been auriferous, but so far as prospected the eastern band has proven the richer.

The gold occurs in association with leaders of quartz up to 4 inches in thickness at the point of their intersection with the indicator. Should the quartz vein fault or break the indicator, the gold appears to be richer.

The following section was taken at the point where Shaw obtained his rich patch, about 80 feet south of the main cross course.

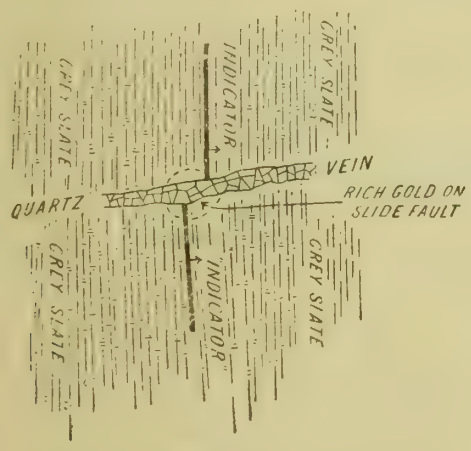



Fig. 11.

Sketch Section—Shaw's Indicator.

In this instance the dislocation moved the beds about 3 inches in a horizontal direction, but south of Baker's gully the slide cuts the indicator right off, and it has not since been picked up.

There is ample room for further prospecting on this line of indicator, and there is little doubt that organized effort would result in further rich patches of gold being discovered.

Clean cross-cuts should also be put out east and west, as this would indicate whether indicators other than those already worked exist, and also the position of slides or quartz lodes, and where they are likely to intersect the indicators.

A cross-cut in the vicinity of Shaw's rich patch should also be driven to intersect the anticlinal axis known to exist south of Baker's Creek, as the known indicators will be found folded over it on the opposite dip, and there is no apparent reason why the slides or quartz leaders already worked should not prove equally rich where they cut the indicator on the opposite leg of "centre country."

The deepest shaft on this line is sunk 135 feet, but the best gold was obtained at about 40 feet.

The following are the recorded gold returns :—

| | Tons. | Yield. |
|---|---|---|
| Shaw and Son ... ... ... ... | 40 | 280 oz. (approx.) |
| " " ... ... ... ... | 4 | 449 oz. " |
| " " ... ... ... ... | 3 | 212 oz. |
| " " ... ... ... ... | 4 | 390 oz. 15 dwts. |
| Brockwell and Stebbins ... ... ... | 4 | 256 oz. |
| Total ... ... | 55 | 1,587 oz. 15 dwts. |

This fine return should no doubt be augmented by much unrecorded gold.

### Potter's Hill Reef.

Some rich specimens were found on this hill in July, 1854, by a man named Potter. During the "rush," which immediately followed, some remarkably fine nuggets and specimens were obtained, amongst those recorded being nuggets weighing 150 ounces, found by James Bagerie, 40 ounces by J. Stuart, and numerous "specks" under 20 ounces. At a later period John Hassett and mate obtained 26 pounds weight of gold on the surface, and several specimens containing from 50 ounces to 100 ounces were discovered by John Reach, Richard Gayton, Smith Jones, Bishop, and others. (Plates 10 and 11.)

This ground was taken up by a Maryborough party, consisting of Messrs. J. R. Gray, John Jackson, H. Conklon, J. Martin, Jas. Messler, and another, in January, 1855, and numerous shafts were sunk. Nothing of a payable nature was, however, discovered, and the enterprise was abandoned until 1861, when it was again taken up by J. R. Gray and Joseph Allan, who sank to as great a depth as 110 feet, but were again unsuccessful.

Subsequent attempts by Mr. J. R. Gray in 1872 and 1888 produced nothing beyond a few colours in the stone, and a 12-ounce piece from a shallow cutting (found by Victor Cherki). In 1896, a local company drove a tunnel 272 feet into Potter's Hill. This company succeeded in getting some small crushings, among which are recorded 4 tons for 23 ounces, and two small crushings by Cowan and McKay, averaging about 8 ounces per ton.

The Potter's Hill tunnel affords a good section of the beds. (See Plate 11.) At 180 feet in, an indicator was intersected just over the western side of "centre-country," but no work has been done in it. Beyond this indicator the country is seamed with quartz veins broken by an extraordinary number of step-faults.

At 35 feet back from the face, a slide bearing N. 9° W. and dipping 55° W. was cut. This seems to form the main lode body, and the auriferous quartz will probably be found on or near it.

### Holloway's (Enterprise) Reef.

This is on the northerly continuation of the Potter's Hill line of country. The first gold was obtained at the south end by William Martin in 1862-3. From the surface to a depth of 20 feet he obtained about 120 ounces.

In 1889, the Korong Prospecting Association took up Martin's claim and sank a shaft to a depth of 140 feet. A considerable amount of driving was done from this shaft, but nothing payable was obtained. From the shallow ground, however, 95 ounces was secured, inclusive of a specimen containing 52 ounces.

North of Martin's claim, Holloway and party obtained some fair gold on the indicator, the highest recorded crushing being 9 tons for 27 ounces; in addition, numerous specimens were found.

In 1893, this claim was sold to a Charlton syndicate, and was worked as the "Charlton Enterprise Company." This company had some fair crushings, the best gold being at about 60 feet to 70 feet. Their highest crushing was 2 tons for 33 ounces; in all 715 tons were crushed for 277 ounces.

On the northern end of the hill, Holloway and Hendry sank a shaft to water-level 145 feet, and opened out at 140 feet. They obtained a considerable amount of specimen-gold, and had two crushings of 20 tons for 25 ounces, and 60 tons for 28 ounces.

At a later date, Gray and party are reported to have obtained payable gold while working the mine on tribute.

From 1 to 3 feet of stone was broken, and at the northern end the indicator and reef were cut off by a dyke cross-course.

The following crushings are recorded :—

| | Tons. | Gold Yield. |
|---|---|---|
| Martin ... ... ... ... | — ... | 120 oz. |
| Korong Prospecting Association ... ... | — ... | 95 „ |
| Holloway ... ... ... ... | 30 ... | 100 „ |
| „ ... ... ... ... | 9 ... | 27 „ |
| Enterprise ... ... ... ... | 715 ... | 277 „ |
| Holloway ... ... ... ... | 20 ... | 25 „ |
| „ ... ... ... ... | 60 ... | 25 „ |
| Total ... ... | ... | 672 oz. (approx.) |

### Victory Reef (Jackson's).

This reef was discovered and opened in 1889, by Messrs. Jackson and Pratt, who formed it into a co-operative party of eight shares. The party worked the reef for eighteen months with payable results, but, the water becoming troublesome, it was formed in 1890 into a public company. An engine shaft was then sunk on the west of the reef to a depth of 162 feet, and at 150 feet a cross-cut was extended east and cut the reef at 83 feet. The reef was from 4 to 9 feet thick, and was driven on north for 50 feet and south for 39 feet. This company was not successful; 84 tons crushed yielding only 16¼ ounces of gold, and the ground was abandoned.

Mr. Gray states that Jackson and Pratt crushed 300 tons for 1¼ ounces per ton.

### Campbell's Reef.

This is also known as the Main Flat Reef. It was discovered in 1855 in the alluvial workings at a depth of 12 feet. I was unable to examine any of the workings, which have either collapsed or are full of water. An excellent description of this reef is, however, given by Mr. Gray*, from which I extract the following :—About 1,000 feet of this reef was taken up in claims of 24 feet in length, and in the greater portion gold was obtained in the reef, but as there was no crushing machinery in the district, only the best part was prospected to any great depth; in all, probably 400 feet of the reef was taken out to depths varying from 20 to 40 feet. At 40 feet water was struck, and in the month of June a slight flood in the creek filled all the claims with water, and most of them caved in, and work was abandoned on the whole line.

In 1857 the reef was again taken up by Wm. Jones and others; a shaft was sunk to a depth of 46 feet and securely timbered. The water was very troublesome, and as none of the adjoining claim-holders would assist in bailing the water, Jones and party resolved to draw their slabs from the shaft, and abandon the claim.

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* History of Wedderburn Gold-fields, pp. 16, 17, 18.

In 1859 it was again taken up by Messrs. Tenny and Clarke. A lease of 12 acres was secured, but did not include the portion occupied by Jones and party in 1857, which was supposed to be the best part of the reef. Tenny and Clarke erected pumping and crushing machinery and sank a shaft about 120 feet south of Jones' shaft. At a depth of 65 feet they got the reef, which was 5 feet in thickness and showed gold, but was not as rich as they expected. Their mine manager was killed in the shaft at this time, and as there was a prospect of getting better stone on Specimen Hill, they resolved to proceed no further with the shaft.

The claim and plant were sold to the Lane's Reef Company, which occupied the ground until the latter part of 1861, but did no work on the reef.

Gray and Waltere secured the lease and plant, and sank a shaft 50 feet north of Tenny and Clarke's shaft. At a depth of 50 feet they cut the reef, which was 3 feet thick and returned nearly 2 ounces per ton (tonnage not stated). This party found that the shaft sunk by Tenny and Clarke would not drain the ground deeper than 56 feet, and when the quartz was taken out to that depth they ceased working.

In 1868 a company known as the Wedderburn Gold Mining Company was formed to work the reef, and a new 8 x 4 shaft was sunk 35 feet west of Tenny and Clarke's shaft. At 151 feet a reef about 15 inches thick was cut. The reef was driven on north, and 20 tons crushed for a return of 19½ ounces of gold. The drive was extended 100 feet northwards and about 50 feet southwards, but none of the quartz proved equal to that near the shaft. The best gold appeared to dip to the north and to pass under the drive, and it was impossible to follow the run of gold without deepening the shaft. The reef was worked upwards from the main drive, but owing to a variety of causes, the chief of which was the large amount of water, the quartz did not pay expenses. This company was in existence about two years, and resulted in a loss of £1,250, of which the shaft cost £750.

A tribute party sank a shaft to 40 feet at a distance of 150 feet north of the well-shaft. In driving east they cut two makes of quartz which appear to have been previously untried ; these were about a foot thick and 3 feet apart ; 30 tons crushed from here have returned 15 oz. 3 dwt. of gold.

The claim and plant again fell into the hands of Mr. Gray, who placed it in the hands of a Ballarat syndicate.

The mine was again pumped dry, and a cross-cut extended east from a depth of 80 feet ; this was driven 25 feet, but no payable stone cut.

In 1888 the mine and plant were purchased by a Melbourne syndicate who spent over £2,000, principally in overhauling the old machinery and erecting new ; this company obtained nothing payable.

Mr. Gray states that " very little genuine prospecting has been done since 1871. The reef is well defined with smooth walls . . . . . and taking all the quartz lifted from the mine, the average could not be less than 3 or 4 ounces per ton."

Unfortunately no tonnages are available.

### Gardiner's (Cosh's) Reef.

This reef lies to the south of the Little Wonder, or Lane's reef, and about 2 chains west ; it coresponds to Gardiner's reef in Lane's ground. Payable gold has been obtained on the surface for a length of 100 feet. All the workings are shallow, consisting of numerous shafts to a depth of 20 or 30 feet ; these disclose a rather spurry formation, reaching to a thickness of 10 feet. Selected stone has returned up to 2 oz. per ton. This ground is, or was, until recently, being worked by Mr. T. W. Cosh with payable results.

### Little Wonder.

The main workings of this mine are situated south of, and on the line of strike of Lane's reef. The whip shaft is 1,870 feet south of Lane's engine shaft. The reef worked is considered an extension of Lane's line. The average width of reef varies from 6 inches to 12 inches, and the shoot of gold to 90 feet in length. The highest recorded crushing is 50 oz. from 10 tons, while much of the stone returned 2 oz. per ton. The lowest workings in this mine are at 100 feet. At present there is a depth of 50 feet of water in the workings, so that I was unable to make a very full examination. The pitch of the gold shoot appears to be to the north. No cross-cut was extended west from the whip shaft to cut Gardiner's and the other lines of reef worked in Lane's ground. (See Plate 15.)

### Lane's Reef.

Lane's reef, is situated about three-quarters of a mile north-east of the township of Wedderburn. It was one of the first reefs discovered in that district, the prospector being Mr. Zeb. Lane, late manager of the Lord Nelson mine at St. Arnaud. Golden stone was found lying on the surface, the first ton taken from the outcrop yielding 73 oz. 4 dwt. of gold. The mining claims at this period did not exceed 48 feet, many being smaller ; from these many remarkable yields were obtained, the ground held by Mr. T. W. Cosh returning up to 90 oz per ton. After the exhaustion of the rich upper zone by the claim-holders the ground was taken up by a Ballarat syndicate, who sank an engine shaft to a depth of 180 feet ; a crushing taken out by this company from the 80-ft. level yielded only 1½ dwt. per ton, and the ground was abandoned without further prospecting. Since then the ground has been held continuously, but very little prospecting undertaken. (See Plate 12.)

Lane's reef varies in width from 1 foot to 5 or 6 feet, but the gold is not evenly distributed through the stone, as a rule only 6 or 12 inches of the footwall being broken, although in cases, judging by the stopes, it has paid to break the reef from wall to wall. The length of the auriferous shoot varied from 100 to 150 feet, and has been worked on a pitch to the north at 1 in 1 for 300 feet.

Above water level (110 feet) the reef has been stoped right back to the surface, but below very little work or prospecting has been done. The workings being full of water, I was unable to examine them personally below 90 feet ; but am informed that at the bottom level (180 feet) practically no work has been

done, while at the only other level (144 feet) very little prospecting was done, and the greater portion of the work consisted of breaking out the hanging wall stone, which was left by the early miners as unpayable. At both of these levels a cross-cut put out east would intersect the reef at a point which is under the shoot of gold. It would be necessary in both cases to drive north to cut the gold worked above.

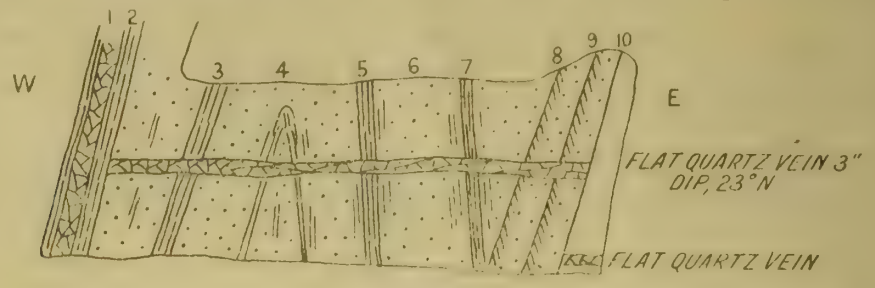



Fig. 12.

Section exposed west of Lane's Reef in Baker's 49 ft. shaft, showing Baker's flat reef. Scale, 3 feet to 1 inch.

1. Laminated quartz reef, 6".
2. Indicator slate 6"—10".
3. Indicator slate. Coarse gold at intersection with the flat reef.
4. Centre country.
5. Indicator slate. Rich gold at intersection with the flat reef.
6. Decomposed rock resembling dyke-rock.
7. Indicator slate. Coarse gold at intersection with flat reef.
8. Slide.
9. Slide.
10. Reversed slide. Throw 2' 4".

On account of the rich returns, attention has always been concentrated upon Lane' reef, to the exclusion of other lines of reef closely adjoining it. At least five well-defined reefs occur within a distance of 320 feet of the engine shaft. These are practically unprospected even at the surface, although of promising appearance, and auriferous at other points outside Lane's ground. Two of these (Scotch Jock's and Gardiner's reefs) gave returns of over an ounce per ton.

### Cherki's Reef.

This was discovered in 1893 by Cherki and Hogan in a small paddock adjoining the Presbyterian Manse. It is approximately on the Specimen Hill line of country, and is essentially one of the indicator occurrences. A vein of quartz 6 inches to 12 inches thick dipping south across the indicator, was cut. At 8 feet from the surface 5½ tons were obtained, and yielded nearly 400 oz. of gold. In addition, a bucketful of stone, taken a few feet south of this patch, gave 90 oz. of gold. I understand that Cherki only sank to about 40 feet.

This indicator is worth further attention.

### Specimen Hill (Ophir) Reef.

The Specimen Hill reef is situated upon a prominent hill just to the north of the township. The name was derived from the number of specimens of gold-bearing quartz found on the surface. The reef from which they were derived was discovered by John Kerr and mate in 1853, who sunk round shaft (still existing) near the northern end of the reef outcrop to a depth of 30 feet. Gold was struck in the reef, but this was before the era of crushing batteries, and the ground was abandoned for more lucrative alluvial mining.

Subsequently, the Messrs. Tatchell occupied the claim, but it was abandoned, to be taken up by Mr. Benjamin Hoare, who erected a Chilian mill for crushing the quartz. In 1856 the southern ground adjoining Hoare's claim was taken up by Messrs. Jones, Kirkhouse, and Bodicombe, who struck gold at 16 feet from the surface, and are reported to have crushed ore carrying up to 50 oz. of gold per ton. The success of this party caused the whole line of reef to be pegged out. Jones' run of gold (apparently the main shoot) pitched south and was traced through several claims to water level; it is said to have diminished in length, and where the last payable stone was broken by Messrs. Gray and Waltere. at 120 feet from the surface, the length of the shoot was reported as 12 feet Two small crushings from this point yielded 2 oz. of gold per ton. The ground was taken over by the Lane's Reef Company in 1860, and again wound up in 1861. Later a Ballarat syndicate sank a shaft near the outcrop of Jones's shoot to a depth of 120 feet, at which point they struck 3 inches of laminated quartz, and then, according to report, ceased work.

The final effort to prospect the reef was made by a Melbourne syndicate, who deepened the last-mentioned shaft to 212 feet (inclusive of the well). At a depth of 200 feet a crosscut was extended east for about 150 feet, the reef being intersected at 25 feet, and driven on 100 feet both north and south without cutting payable gold. The southern level does not appear to have been driven far enough south to cut Jones's shoot of gold.

Structurally the Specimen Hill reef is similar to Lane's reef, being formed on a fault dipping west across the bedding. The footwall of the reef is composed of laminated quartz from a few inches to 1 foot thick, whilst numerous quartz veins—in the aggregate amounting to several feet in thickness in places—drop from the enclosing beds into the reef channel. The gold appears to have been confined to the laminated portion of the reef. (See Plate 13.

### Canadian Reef.

This reef is about half a mile north, and 2 chains east, of Specimen Hill reef. It was discovered in 1856 by Payan, Blake, and McKay. It was worked to a depth of 30 feet, and crushings up to 8 oz. per ton obtained. The reef appears to be well defined, and is coincident with the bedding. It dips west at a high angle, is about 2 feet thick, and sends numerous "droppers" from the footwall into the country (Plate 13 and Fig. 13).

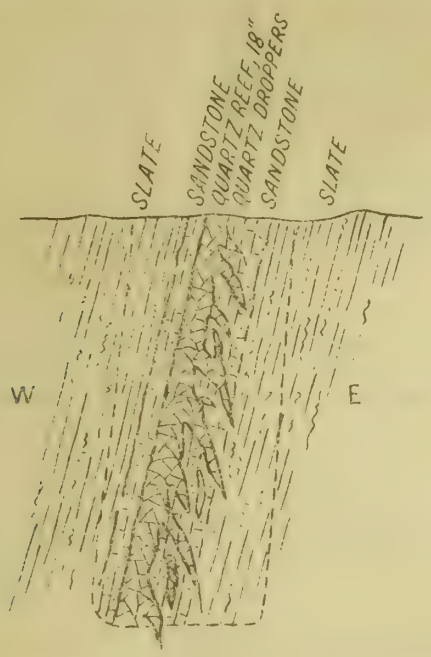



Fig. 13.
Section of Canadian Reef as seen in the open cut. Scale, 10 ft. to 1 in.

### Jubilee Reef.

This lies a little to the north and east of the Canadian reef, and is on the same belt of country. It consists essentially of small, flat veins of quartz (Plate 13) traversing highly decomposed beds, in which there are probably one or more indicators that have lost their dark colour through decomposition.

The total amount of gold obtained was about 60 oz.

### Di Marchi's Reef.

This is situated to the south and east of the Jubilee reef. Gold was obtained for about 80 feet in length, and 30 feet in depth. It occurred in some small leaders dropping from a large iron-stained reef to the east, and intersecting a small, bluish-coloured indicator, which looked like a pencil mark. The total crushings amounted to 40 tons, and yielded 30 ounces of gold. (See Plate 13.)

### Champion Reef.

This reef (like Campbell's) was discovered while working the alluvial ground. It is on a portion of the Main Flat, about one mile west of north from the town. In 1864-5 it was taken up by Di Marchi, Hall, Gray, and Ball, who sank to about 20 feet, where they cut a well-formed reef, about 18 inches in thickness. About 20 tons were crushed for 8½ dwts. per ton, but this was not sufficiently good at the time, and the claim was abandoned. Practically no more prospecting was done until 1888, when it was taken up by Victor Cherki and mate. They sank near where the original prospecting was done, and were soon on payable gold. Messrs. Buckley, Olive, and Colin Gray, who held the claim north of Cherki's, also obtained payable gold at the same time.

Cherki and party sold to a Melbourne syndicate, who formed the Champion G.M. Company. This company crushed 62 tons for a return of about 376 oz. of gold, and then suspended operations on account of water. Their richest reported crushing was 25 tons for 166 oz. of gold.

Following the cessation of work by the company, Messrs. Davies and Eilders obtained a patch of 100 ounces on the next indicator east of that worked by the company; they also crushed 7 tons for 30 oz. The Messrs. Noonan Bros secured the ground in 1902, and at a depth of 35 feet struck a rich patch which returned £1,500 worth of gold, the specimens weighing 40 pounds. During the year they obtained 306 ounces of gold from 3 tons of stone, 280 ounces being in one dish.

Five indicators appear to exist here in close association. They dip east at one in four, and are crossed and faulted by a well formed slide reef 18 inches in thickness, dipping west at one in three. From this reef numerous flat veins of quartz from 1 inch to 3 inches in thickness are given off and intersect the indicators. It was at the intersection of these flat veins with the two western indicators that the company and Noonan Bros. obtained their gold. The eastern indicator bands were, however, auriferous north of the cross-course (see Plate 16) where worked by Buckley and Olive.

The indicators have not been picked up below the place where they were faulted by the reef.

The engine shaft is 65 feet deep and has cut the reef but not the indicators.

### Queen's Gully Line of Reefs.

The reefs along this line are directly associated with a well defined indicator which can be traced from Queen's Gully to Bocca Flat. There are, apparently, two or more indicators from which gold has been obtained, but that to which most attention has been given is the most westerly. (See Plate 24.)

The reefs are essentially quartz veins in association with the indicator. Some of the richest stone on the field has been obtained along this line; and the alluvial was greatly enriched where it crossed Queen's Gully and Bocca Flat. The various claims were known as the Kanaka, Cerberus, Queen's, Cameron's, and, north of Bocca Flat, Rodger's.

The Kanaka reef was discovered in 1857 by Messrs. Rennie and Owen. A small vein coincident with the indicator, and about 2 inches in thickness, was worked for a length of 300 feet and to a depth of 40 feet, where it was cut off by a slide. It is asserted that nearly 2,000 ounces of gold were taken from this vein.

A shaft was sunk to a depth of 160 feet by Messrs. Gould and Timm, but they did not succeed in picking up the quartz. Messrs. Gray and Waltere took the last recorded crushing from this claim in 1862, 20 tons returning 25 oz. of gold.

The Cerberus reef was first opened in 1857, but was not worked to any extent until 1873, when it was taken up by Messrs. Wm. Timm, James Ross, J. R. Gray and A. Hansen, who sank a shaft to water level (150 feet). The width of the reef varied from 1 foot to 4 feet; the shoot of gold was about 100 feet in length and was worked to a depth of 40 or 50 feet. In all, 159 tons of stone were crushed for a yield of 9 dwts. per ton.

Queen's reef is on a parallel line of indicator, 4 chains east of the Kanaka line. It was opened in 1860, and a few ounces of gold were obtained. In 1883 Messrs. Smith and Holloway broke 30 tons, which averaged 12 dwts. per ton. The conditions here differ from those at the Kanaka, the gold being obtained in a series of small flat veins intersecting the indicator, while on the Kanaka line the stone is better defined and nearly vertical.

Northwards, and apparently on the same line as the Kanaka, Messrs. Pemberton and Drysdale obtained crushings up to 10 ozs. per ton, and further north Cameron averaged 1 oz. per ton. In Pemberton's shaft a small vein on the western side of the indicator was worked; this dipped west at 83°, while the indicator dipped east at 85°. Near the bottom of the shaft, the indicator was cut off by a flat slide, and thrown 10 feet. This slide is of the reversed order. In fact, I think this form of slide prevails, and it would be well for prospectors to bear this in mind when searching for dislocated indicators and reefs.

A most interesting feature about this line of indicator is that it is auriferous in itself to the extent of over an ounce per ton, apart from quartz inclusions. For a width of from 4 inches to 6 inches the indicator appears to carry more or less gold throughout, and in parts it is richly auriferous. Attempts have been made locally to treat this material by ordinary battery processes, but, on the addition of water it impacts and becomes impervious. For the same reason it is not amenable to ordinary cyanide treatment. To ascertain if this material could not be profitably dealt with by one of the known economic processes, a bulk sample was forwarded to Mr. Bayly at the Mines Laboratory. From his interesting and valuable report given below, it will be seen that an extraction equal to 91 per cent. of the assay value can be obtained.

I may state that the sample forwarded, which assayed 1 oz. 2 dwts. 9 grs. of gold per ton was not selected on account of any greater richness than other samples, and that probably richer material exists in places along the indicator. A previous sample from the same shaft gave a return of 1 oz. 1 dwt. 13 grs. of gold. The extent of this gold-bearing slate, together with the practical certainty of obtaining rich quartz veins in association with the indicator, points to this being a valuable proposition, worthy of much more attention than has yet been given it.

*Report on Auriferous Slate.*

Auriferous Slate, Pemberton's shaft, Queen's Gully Indicator; for Metallurgical treatment. (Lab. No. 331/08.)

A previous specimen (No 238/08) had been received of this material: and on account of its high assay value, viz., 1 oz. 1 dwt. 13 grs. per ton, a larger sample weighing 19 lbs. was procured for systematic examination. The material consisted of small fragments of soft slate easily broken down.

Procedure:—The whole sample was broken down to pass through a 60 sieve, and the following tests made:

A. Assay
B. Concentration Test
C. Amalgamation
D. Chlorination
E. Cyanide

| | Gold per Ton. | Silver per Ton. |
|---|---|---|
| A. Assay ... ... | 1 oz. 2 dwts. 9 grs. ... ... | 0 oz. 1 dwt. 19 grs. |

B. Concentration Test.—

| — | Percentage of Whole Sample. | Gold per Ton of Fraction. | | | Gold per Ton of Ore. | | | Percentage of Total Gold. |
|---|---|---|---|---|---|---|---|---|
| | | ozs. | dwts. | grs. | ozs. | dwts. | grs | |
| Concentrates | 1.5 | 37 | 0 | 20 | 0 | 10 | 11 | 46.8 |
| Tailings | 21.5 | 0 | 11 | 18 | 0 | 2 | 12 | 11.1 |
| Slimes | 77.0 | 0 | 12 | 10 | 0 | 9 | 10 | 42.1 |

This represents very fair concentration, as nearly half of the gold is recovered in a very small rich concentrate which could be treated separately. It is important to note that a large percentage of the gold goes away in the slimes.

C. Amalgamation.—

A series of experiments were made to show whether the gold existed in such a state as to be recoverable by amalgamation. In three experiments the ore was ground in contact with mercury, and in the fourth contact was given by agitation with no better result.

| Exp. | Gold per Ton in Residue. | Percentage of Gold Recovered. |
|---|---|---|
| 1. | 0 ozs. 15 dwts. 0 grs. | 67.2 per cent. |
| 2. | 0 „ 15 „ 16 „ | 70.2 „ |
| 3. | 0 „ 14 „ 16 „ | 65.8 „ |
| 4. | 0 „ 14 „ 19 „ | 66.3 „ |

These experiments were made with all care, and the results show that an average extraction of at least 67.4 per cent. of total gold can be made by direct treatment. It is desirable to use caustic soda in amalgamation.

D. Chlorination.—

Chlorination tests were made on the ore without washing.

| Exp. | Gold per Ton in Residue. | Percentage of Gold Recovered. |
|---|---|---|
| 1. | 0 ozs. 3 dwts. 22 grs. | 82.2 per cent. |
| 2. | 0 „ 2 „ 15 „ | 88.4 „ |
| 3. | 0 „ 2 „ 15 „ | 88.4 „ |
| 4. | 0 „ 1 „ 23 „ | 91.1 „ |

The best extraction, 91.1 per cent. of total gold, is very satisfactory, and taking even the lowest figures, an average extraction of 87.5 per cent. was obtained. The better result was obtained by longer time of contact with the gas. Roasting is unnecessary with this ore.

E. Cyanide.—

Owing to the fine slimy nature of the ore it was found impossible to cyanide by percolation. The material is quite impervious to solution once it has become wet. Under working conditions it might be possible to obviate this by mixing coarse sand tailings. The experiments were continued by agitation and kept going for different times.

The solutions used contained 0.25 per cent. KCN.

Lime added to neutralize; 3 lbs. per ton ore (this is probably in excess of required amount and could be reduced in practice).

| Exp. | Time in Contact. | Time Stirred. | Gold per Ton in Residue. | Percentage of Gold Extracted. |
|---|---|---|---|---|
| 1. | 48 hours. | 16 hours. | 0 ozs. 2 dwts. 15 grs. | 88.4 per cent. |
| 2. | 48 „ | 16 „ | 0 „ 1 „ 15 „ | 92.5 „ |
| 3. | 120 „ | 27 „ | 0 „ 1 „ 15 „ | 92.5 „ |
| 4. | 120 „ | 27 „ | 0 „ 1 „ 7 „ | 94.2 „ |

The consumption of cyanide was about 4·5 lbs. per ton of ore treated and the extractions obtained are good.

From the above experiments it would appear that this material is a valuable proposition as regards economic gold recovery. Whichever form of recovery was tried the results were always satisfactory, and there is no reason why the same or even better results should not be produced on a large scale.

Thus by direct concentration nearly half the gold was recovered, and by direct amalgamation up to 70 per cent is recoverable. Both chlorination and cyanide treatments gave good results, but as the latter would require agitation it is probable that chlorination would be the more economic. As the extraction in each case is very good it would be necessary, before deciding on the method of treatment, to take into careful consideration local conditions of labour, and the fuel and water supply available. A small experimental plant should first be erected to be run on a working scale. The above results, however, indicate that the material would be worth development.

### Scotch Jock's Reef.

This reef is situated about 6 chains west of Lane's line of reef. It is formed on a slide-plane, and is associated with an indicator.

It was discovered in 1858 by Rennie, Owen, and Ross, who crushed 20 tons for 21 ounces of gold taken from a reef about 12 inches in thickness. Later, some small crushings yielding from 3 dwt. to 15 dwt. per ton were obtained, and Henderson and party are said to have got returns as high as 3 ounces per ton from small lots.

### Ford's Reef.

This is north of, and apparently on the same line as Scotch Jock's indicator. It is interesting from the fact that the reef and indicator are in contact with a cross-course dyke previously described (p. 17). It was near the point of contact that the gold was obtained. A nice body of quartz 4 or 5 feet in thickness is exposed dipping west; the auriferous portion seems to have been near the footwall. As far as can be seen the indicator has been crushed and broken by the reef. In 1862 Messrs. Wm. and Harry Timms obtained 25 tons of quartz which yielded over 1 oz. per ton. The shoot was lost and has not since been picked up. (See Plate 21, fig. 2.)

### Chinamen's Hill Reef.

This is situated to the south-west of Ford's Reef and on a parallel line west of Scotch Jock's indicator. The line of reef is well defined longitudinally, and appears to consist mostly of flat spurs ramifying through a small belt of country. A shaft has been sunk 165 feet through these leaders, but no thing very rich found. 60 tons of stone are recorded as yielding about 4 dwts. per ton, but Chadwick got as much as 26 oz. from 8 tons.

### Hermit Reef.

This reef lies east of the Specimen Hill line, and west of the Chinamen's Hill line. It consists of a small body of laminated quartz lying on the footwall or eastern side of a large quartz reef, which attains in places a width of 15 feet. Messrs Chadwick and Barclay are reported to have mined about 200 tons of quartz which averaged about 10 dwt. per ton.

### Gowk's Hill Reef.

This is north of the Scotch Jock's line. In 1869 a shaft was sunk to 100 feet, and 24 tons of stone were crushed for an average of 4 dwt. per ton. A co-operative party got 12 oz. from 6 tons, and McDonald crushed 5 tons for a return of 8 dwt. per ton. Shaw and Archey are also reported to have obtained fair yields.

### Edwards and Symon's Reef.

This reef is situated on the Lane's reef line of country, and has a strong similarity to Baker's reef, which is 30 feet west of Lane's reef where worked. (See Plates 4, 18, and 19.)

It is a nicely laminated body of stone from 6 inches to 10 inches in thickness, lying on an indicator which dips west. Two shoots of gold occurred, the southern being about 20 feet in length and worked to a depth of 70 feet; and the northern about 90 feet in length and worked to 94 feet in depth. Crushings from the former ranged from 2 dwt. to 9½ dwt. per ton, and from the latter 10 crushings were taken varying from 6 dwt. to 19½ dwt. per ton. The gold appeared to be cut off by a slide (see section, Plate 19).

It is apparent from the cleavage in the beds associated with this reef that "centre country" is not far to the east, and as the reef is coincident with the bedding, a short crosscut should be made eastward to examine both centre country and the indicator bent over it.

### Frenchmen's Reef.

This is in one of the head branches of Bocca Flat, and was discovered in the alluvial workings in 1858. One ton of stone broken from a leader 2 inches in thickness, is reported to have given 104 oz. of gold. Very little prospecting has been done.

### Rodger's Reef.

This reef is apparently on the same line as the Queen's Gully indicator, and is situated on Bocca Flat. It is said to have been very rich on the surface. The gold was confined to a run of stone about 15 inches thick at its widest, but gradually diminishing as it dipped northwards, and was eventually lost about 25 feet north of the outcrop. In 1871 a tribute party composed of J. R. Gray, Jas. Ball, Dickman, and Ross, sank near where the stone cut out, and at a depth of 24 feet struck the reef, which proved to be barren. In driving north they struck the auriferous quartz at 4 feet and are reported to have obtained 250 oz. of gold.

The deepest shaft is 80 feet, but gold does not appear to have been found below 30 feet.

The above-mentioned mines are the principal ones worked in the normal Ordovician rocks. At scores of unmentioned points, along these and other lines, small patches of a few ounces of gold have, however, been obtained.

## THE MINES IN THE METAMORPHIC ROCKS.

The following mines have been worked in the metamorphic rocks of the eastern portion of the goldfield :—

### Buckeye Reef.

This is a large, well-defined body of quartz on the western side of Farmer's Gully. It was discovered in 1866 by Mr. John Burnie. Gold has been traced in leaders through the reef for a length of about 100 feet. Burnie's crushings are said to have averaged about 10 dwt. per ton. Small crushings have also been taken out subsequently. Edwards obtained 5 oz. from 14 tons, the best crushing being 5 tons for 2 oz. 10 dwt. 12 gr.

### Christmas Reef.

This was opened by Burnie in 1869, and is parallel and similar to the Buckeye Reef. Burnie obtained one small crushing which gave 6 oz. per ton. Subsequently Murphy and Leech crushed 3 tons for 7½ dwt. per ton, 2½ tons for 7 dwt. per ton; and Finlay 3 tons for 14 dwt. per ton. This reef is worth further prospecting.

### Annie Jones' Reef.

Found by William Jones in 1864 to the south of the Christmas reef. The reef is well-defined and about 6 inches in thickness (see Plate 20). Jones crushed about 200 tons for 11 dwt. per ton; Reid and Walker had crushings yielding 10½ dwt.; and J. R. Gray 7½ dwt. per ton. Other recorded crushings are 4 tons for 5 dwt. per ton and 7 tons for 2½ dwt. per ton. Kettle and Edwards had 2 oz. 9 dwt. from 8 tons, and Gregson 18 oz. 8 dwt. from 32 tons. The latter crushings were taken at about 60 feet in depth.

### General Grant Reef.

This was discovered in the alluvial workings in Farmers' Gully in 1860 by Wm. Martin. The reef is well-defined but is in hard country. Yields as high as 22 dwt. of gold per ton are said to have been obtained, but the average was 5 or 6 dwt. At different times Messrs. Sherwood, Halloway, Gray, Edmonds, Arnold, Milton and others had small crushings yielding between 6 dwts. and 1 oz. per ton. Mr. L. Mandeville sank a shaft to 100 feet in 1882. Gold could be seen in the stone at that depth, but it was not considered payable under the existing conditions. The gold is said to have been evenly distributed through the stone.

### Ludlow's Reef.

This is just east of and parallel to the General Grant reef. Twelve tons of stone taken from the surface of this reef gave 15 oz. of gold. It is a well defined reef, about 12 inches in thickness, and has been very little prospected.

### Edmonds' Reef.

Opened in 1868 by F. Edmonds and mate. This is in the same belt as the General Grant and Ludlow's reefs. Fifty-six tons of quartz have been crushed for an average of about 1 oz. per ton.

The reefs forming the above-mentioned group are sufficiently close together to be commanded by a strong company from a main shaft.

### Polewell's Reef.

This is situated at the head of Farmer's Gully. Polewell obtained about 12 oz. from a small leader near the surface, and J. R. Gray broke a small crushing between 15 and 20 feet in depth from 18 inches of quartz, which returned 1 oz. per ton.

### Robinson's Reef.

This is north of the Buckeye reef. The highest crushing recorded from here is 7 tons for 23 oz. of gold.

### Shamrock Reef.

This is on the main spur between the heads of Farmer's and Pooles' Gullies.

It was discovered in 1872 and was then known as the Prince's reef. The quartz varies between 1 and 2 feet in thickness; and associated with it are several beds of indicator slate. The first crushing of 12 tons gave 1 oz. per ton. Shortly afterwards the run of gold was lost, but was again picked up 100 feet south by Martell and party in 1888. This party obtained some good crushings, the best recorded being 5 tons for 14 oz., broken at 135 feet. The mine was floated into a company, and a shaft was sunk to 220 feet. The company's crushings were taken at, and above, 150 feet, and are said to have averaged about 1 oz. per ton.

### The La Mascotte Mine.

The La Mascotte mine is situated 3 miles 10 chains due north east of the Wedderburn Post Office, and is one of the most easterly lines of auriferous reef discovered in the belt.

The original discoverer was Mr. Tom Martin, who traced a run of alluvial gold up the side of the hill from a part of Hunter's Gully now known as Klondyke. The auriferous outcrop was found near the cap of the spur at the source of the surface gold. This was about the year 1896. Martin sunk a shaft on the reef to a depth of 9 feet, and is reported to have obtained several ounces of gold by dollying. In consequence of a slight break in the reef it was abandoned, but late in the year 1898, was reprospected by Messrs. George Leech and Victor Cherki, who almost immediately got on to payable gold. The prospectors sank an underlie shaft on the reef, payable gold continuing for about 16 or 18 feet and reaching a maximum length of 13 feet. The main body of reef ranged between 2 feet 6 inches and 3 feet 6 inches, but the auriferous portion did not exceed 8 inches, and averaged about 4 inches. In all 12 tons of stone were crushed for a yield of 30 oz. 19 gr. of gold, in addition to which 5 oz. 2 dwt. 9 gr. were obtained by dollying specimens, giving a total return of 35 oz. 3 dwt. 4 gr. of gold.

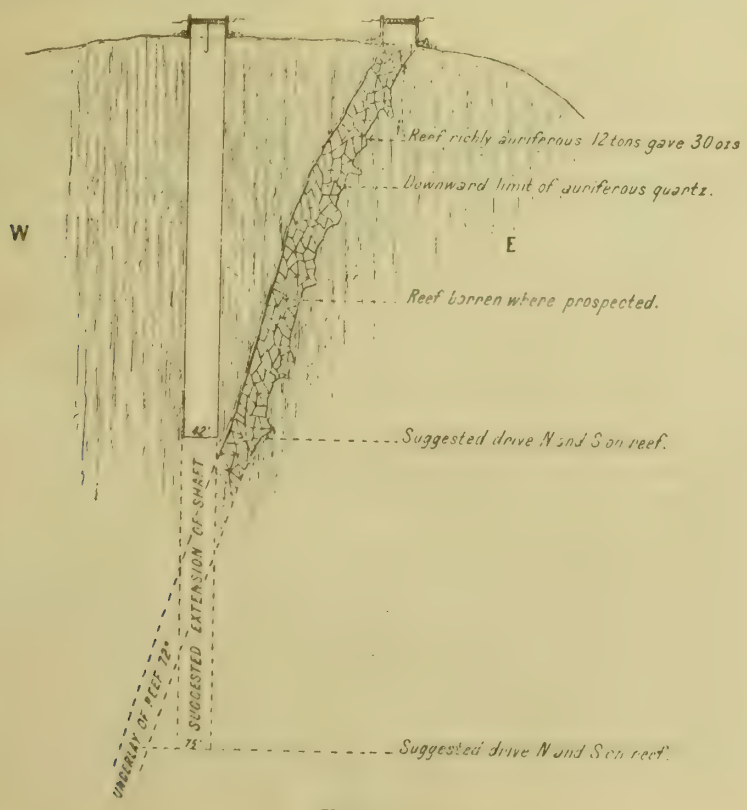



Fig. 14.

Vertical Section: Scale, 20 feet to 1 inch.

A vertical shaft was sunk to the west by the prospectors, cutting the reef on its underlie at 40 feet; the bottom of this shaft has been connected by winze with the underlie shaft from which the gold was obtained, but nothing payable was intersected.

At 18 feet in the underlie shaft—that is just below where the gold was lost going down—rough levels have been extended about 23 feet both north and south, but with no success. Promising looking stone shows in both faces. No levels have been extended from the bottom of the 40-foot shaft.

It will thus be seen that beyond piercing the reef by an underlie shaft to a depth of about 25 feet below where the gold apparently cut out, this reef has not been prospected.

The La Mascotte reef is typical of the reefs of the metamorphic area. It is a body of quartz ranging between 2 and 4 feet in thickness. It has a westerly dip varying from 62 deg. to 72 deg. and a strike of N. 5 deg. W. The hanging wall is clean and well defined, but the footwall is very irregular and penetrated at frequent intervals by "droppers" or quartz veins falling into the foot-wall country. The country intersected by the reef is much metamorphosed by the underlying granite; and at the La Mascotte Mine the beds are almost vertical or slightly inclined to the east—that is, the country and reef intersect at an angle of about 30 deg. As is frequently the case with reefs of this description, the auriferous portions appear to occur in bunches, or short shoots, due probaby to the nature of the country rock with which the reef happens to be in contact. In the case of the La Mascotte reef, however, I was unable to observe any of the carbon-bearing schists which seem to have influenced the deposition of gold in so many other of the auriferous reefs in the Wedderburn district. A noticeable feature in the La Mascotte reef is that where the gold occurs we have a "shoulder" in the wall of the reef caused by the reef changing its underlie from 63 deg. W. to 72 deg. W. In other places I have noticed such an occurrence to be favorable to the deposition of gold, and it may be the case here. If another make of gold should be found it should afford some valuable information for comparison.

Unfortunately it very frequently occurs in these mines, that, when the gold is lost, prospecting is carried on in a very disorganized way, a rise being put up in one place, a winze sunk in another, and so on in a disconnected manner, the result being that the mine is closed down without having received a fair trial.

As a business proposition the testing of the La Mascotte mine is a simple one. The shaft at present down 42 feet should be continued to 75 feet. At 42 feet and at 75 feet, levels should be extended on the reef at least 30 feet in both directions, and the levels connected by a rise or winze. At a favorable point a cross-cut should be put out both east and west to guard against any formation being missed. If, by such work, gold should not be struck, nor very favorable indications disclosed, it would, in my opinion, be well for a small party to discontinue operations.

An estimate of such work could be obtained from the mine manager, and should not prove high as the ground is soft and stands well without timber.*

### Nil Desperandum Reef.

This is the most northerly and easterly reef yet opened. It was discovered in 1896 by Raymond and party. The lode body is from 1 to 2 feet in thickness and strikes N. and S., while the enclosing mica schist strikes N. 20 deg. W. The underlay is flat to the west.

Where discovered this reef showed rich gold in the outcrop, a trial sample of 7 cwt. forwarded to Parker's works at Footscray yielding 7 oz. 9 dwt. 16 gr. of gold. Although prospected to a depth of 50 feet nothing else of a payable nature has been discovered.

From the Emu and Kangaroo reefs, which occur in the same belt as the Nil Desperandum, a few ounces of gold have been obtained.

## SUGGESTIONS AS TO FUTURE MINING OPERATIONS.

As the result of my examination of the auriferous lines of reef on this field, I am convinced that large amounts of gold still remain above water level, and that individual effort, or perhaps lucky chance in the discovery of some lost or fresh shoot of gold, will again direct the attention of co-operative parties of miners to the possibilities of these reefs. I feel assured that well organized efforts by small co-operative parties will lead to the recovering of the lost or faulted shoots of gold occurring in the various mines enumerated. In addition, there are scores of outcropping indicators to be seen at the source of rich alluvial gullies, on which a shaft has never been sunk.

The reefs and indicators above water level are essentially suited for co-operative mining. The ground is soft, but stable, and, as a rule, requires neither explosives nor timber. There is usually ample water for nine months of the year, and timber is abundant for building and firewood.

Company mining has, so far, not proven profitable; but, as I have previously pointed out, the failure has been due more to the want of funds for prospecting than to the want of productiveness of the reefs below water level.

I have no doubt that the surface auriferous features will be found repeated below water level, but it must not be lost sight of that mining costs will increase with depth.

A shaft, to be opened at different levels to 400 feet, is required. The country should be cross-cut at least 200 feet east and west of the known lodes.

The Lane's reef line of country appears to offer most inducement for deep sinking. The main lode cuts the country on the dip, and, apart from the original shoot of gold worked from the surface, it may be expected to make gold when in contact with the indicator slates which enriched the flat veins where intersected in Baker's cross-cut. In addition, auriferous lines of indicators, such as Baker's, Gardiner's, and Scotch Jock's, lie within cross-cutting distance to the west.

I regard the four following mines as being the most important in this field :—Lane's reef, Champion reef, Queen's Gully reef, and Specimen Hill reef.

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*This report was made on 1.12.05, and published in Rec. Geol. Surv., Vol. II., Part 4, pages 135-137.

## LIST OF WORKS DEALING WITH THE WEDDERBURN GOLD-FIELD.

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## DESCRIPTION OF PLATES I. TO IX.

*(Photographs by Mr. J. J. Caldwell.)*

Plate 1, Fig. 1. Photograph showing the line of contact between the Older and Newer Granites, which are indicated in the Wedderburn Quarter Sheet Map, G1 and G2 respectively. The boundary between the two is marked by the dark irregular line which traverses the picture horizontally; this separates the older and coarser variety from the later granite on the far side. Two small dykes or veins from the newer granite traversing the older can be seen, one near the centre of the picture and the other, which does not show very clearly, running from the hinge of the foot-measure towards the right-hand bottom corner of the photograph. Near north-east corner of Block 60, parish of Korong, looking north-east.

Fig. 2.—Another view, showing the contact of the granites. The older granite (G1) is seen on the left-hand side of the picture, where it forms a smooth surface, for the most part not covered by vegetation; the newer granite (G2) occupies the rest of the picture, and can easily be distinguished on account of its more rugged surface, due to its different manner of weathering. Near the south-east corner of Block 58 of B, parish of Korong, looking north-west.

Plate 2, Fig. 1.—Tors of newer granite (G2). These have been formed, as is usual in granite country, by certain portions of the rock offering more resistance to denudation than the surrounding parts, which decayed, and were then removed by wind and weather. Shows the somewhat ill-defined tabular jointing of these granites and the effects of weathering in producing cavernous hollows in the rocks. The indentations in the face of the rock are probably caused by the freezing and expansion of water in the weather cracks during frosts. Near southern boundary of Block 57, parish of Korong.

Fig. 2.—A granite tor, showing a peculiar type of weathering. The fissuring depicted on the face of this rock can be observed in many places in this locality, but is always confined to the eastern side of the rock, which faces the rising sun. It is ingeniously explained by Mr. E. J. Dunn as being probably due to the rapid expansion caused by the rays of the sun striking the face of the rock on frosty mornings. Block 57, parish of Korong.

Plate 3, Fig. 1.—Another granite tor in the same locality. It gives a further illustration of sun cracks, tabular jointing, and weathering.

Fig. 2.—An anticlinal fold near Wedderburn Railway Station. This photograph indicates the manner in which the Ordovician sedimentary rocks have been folded, and explains the apparent continuous easterly dip of the beds of this gold field. It will be observed that the western leg is more nearly vertical in dip than the eastern. This dip becomes steeper as it descends, and gradually merges into an easterly dip. This over-folding apparently prevails throughout the field. The cleavage planes dipping steeply to the east are also well shown. The dark band which indicates the anticline in this picture consists of a black carbon-bearing slate ("indicator"), accompanied on both legs and cap by a laminated quartz vein from 1 inch to 3 inches thick, forming a saddle reef. To the south this line of country has been worked for gold. The pitch is to the north. Near centre of the railway cutting just east of Wedderburn Railway Station, looking northwards.

Plate 4, Fig. 1.—A synclinal fold in the Ordovician immediately east of the anticlinal shown in the last figure, of which it forms the compliment. The photograph was taken on the opposite side of the cutting, looking south, so that the right-hand side of the picture is the western. The same overfold character is depicted, but to a more marked degree. This syncline is considerably faulted, the fault following the well-marked bedding plane traversing the picture downwards from left to right.

Fig. 2.—A typical decomposed, buff-coloured dyke intruded into the Ordovician sediments. The eastern wall of the dyke is coincident with the dip of the beds; the western wall cuts them at a small angle. The outcrop of this dyke is not indicated by any difference in the configuration of the surface. Near the centre of the Wedderburn Railway Station cutting, looking south.

Plate 5, Fig. 1.—The quartz reef in Symon's Claim on Edward's Reef, near Boort Flat, about 2 miles north of Wedderburn, looking south. In the upper right-hand side of the photograph a quartz reef about 12 inches in thickness is shown, lying conformably on an "indicator slate" about 1 foot thick; both dip steeply to the west. This reef has been worked to a depth of 90 feet, for yields of gold varying from a few dwts. to an ounce of gold per ton. This reef and indicator appear to be an extension of the formation worked by Baker and party 50 feet west of Lane's Reef stopes (see next figure). An anticlinal fold occurs about 20 feet to the east, but is obscured by Pliocene cement.

Fig. 2.—The open stopes of Lane's Reef, from which quartz yielding up to 90 ozs. of gold per ton has been removed, looking south. This shoot of gold pitched north, and extended down to a depth of 80 feet. It is unexplored below 140 feet. In the top right-hand corner of the picture part of the mullock tip from a shaft on Baker's Reef workings can be seen. A series of flat leaders of auriferous quartz dipping north extend from Baker's Reef to Lane's Reef.

Plate 6, Fig. 1.—Outcrop of a large barren quartz reef at White Rock Hill, about 1 mile west of Wedderburn Railway Station, looking south. This gives a fair illustration of the so-called "buck reefs" of the district. The quartz is amorphous, and does not appear to be auriferous. The part shown in this picture stands 12 or 15 feet above the surrounding rocks.

Fig. 2.—A further illustration of a large barren "buck reef" at Hermit Hill, north of Wedderburn. This reef is about 20 feet in thickness, and can be traced for at least a quarter of a mile. The main body is not auriferous, but on its eastern wall a small laminated reef (evidently of subsequent origin) has been profitably mined.

Plate 7, Fig. 1.—A portion of the Hard Hills, looking south-west. This photograph gives a fair conception of the hills of auriferous cemented wash of Pliocene age resting on the Palæozoic rocks. This wash was deposited in the Pliocene stream beds; the denudation of the country and changes in the streams since then have left more or less isolated patches of it as low hills. Loose blocks of cement and the gold workings in the formation can be seen near the top of the hill. The tunnel in the foreground has been driven in the Ordovician rocks completely through the hill, the object being to cut certain lines, which it was hoped would prove auriferous, and to tap the base of the cemented wash. The work remains a tribute to the energy of the late Mr. Holloway, who at the ripe age of 70 years drove the tunnel single-handed. Unfortunately the venture was not successful.

Fig. 2.—A closer view of the cemented wash of Pliocene age, Sugarloaf Hill, south of Wedderburn. It is formed of rounded quartz pebbles, cemented together with sand and limonite. A large amount of alluvial gold has been obtained from this "cement"; and the adjacent alluviums have been considerably enriched by the gold derived from its denudation.

Plate 8, Fig. 1.—Model of a nugget made shortly after its discovery at Possum Point in 1889. This was the last large nugget found on the Wedderburn field. It weighed 336 ozs. net. A nugget weighing 144 ozs. was also discovered in the same locality by Mr. T. W. Cosh in 1854.

Fig. 2.—Head of Poverty Gully, looking south. This shows the manner in which many of the gullies have been worked (or surfaced) to the watershed. On the opposing fall (beyond the figure), McKinnis' Gully has been worked in a similar manner. The shaft indicated by the mullock heap on which the man is seen standing was sunk on some "indicator" slate beds, but without success. The "indicators" have been bent over into an anticlinal at this point.

Plate 9, Fig. 1.—This photograph, taken on the property of Mr. Patterson, of Nardoo Ranges, shows a hollow tree, in which holes have been cut with stone tomahawks by the aboriginals. This work was certainly done before the country was inhabited by white men. By means of these holes any opossum in the hollow tree could be caught.

Fig. 2.—Face of granitic boulder, Mt. Korong, Wedderburn, showing large crystals of felspar.

# APPENDIX.

## PETROGRAPHICAL NOTES.

*By D. J. Mahony, M.Sc., F.G.S.*

### The Palæozoic Sedimentary Rocks.

The specimens of Palæozoic rocks from the Wedderburn Gold-field consist of soft slates of various shades of grey and fine-grained red and yellow sandstones. The slates are of particular interest since certain beds known as indicators are directly associated with richly auriferous quartz, and others, which are free from quartz, themselves contain gold. The indicators are spotted slates, darker in colour than the usual rocks, and always contain free carbon (see analyses, p. 14), which Mr. Whitelaw suggests is the precipitating agent that caused a concentration of gold in the quartz veins where they cross the indicator. The specimens were not suitable for slicing for microscopical investigation.

The most interesting slates are those which are themselves auriferous. The richest is a bed from 4 inches to 6 inches wide, situated at Queen's Gully. Various assays gave returns of 1 oz. 2 dwt. 9 grs. of gold per ton, 1 oz. 1 dwt. 13 grs., 15 dwt. 16 grs., &c. It is a soft spotted slate, and presents no striking difference in appearance from the spotted slates which are widely distributed throughout the State. The gold appears to be all finely divided. No pyrites was noticed in the concentrates.

Some of the gold separated by washing was examined under the microscope. It consists largely of crystals, with smooth, brilliantly reflecting faces, which occur either alone or in groups, and are sometimes associated with rough amorphous looking gold. Some of the irregular pieces are crystalline, and present bright faces. All the gold is exceedingly small, ranging in size from about 0.001 in. to 0.003 in. in greatest diameter for individuals. The predominating form appears to be the rhombic dodecahedron, and there are probably other faces present, but the difficulties of exactly determining all the faces of such minute crystals are very considerable. Many of the other particles have a granular looking surface, but none of them have the appearance of having been waterworn. The form of the gold suggests that it is of secondary origin, and that it did not form part of the detritus from which the slate was originally built up.

A specimen of spotted slate (No. 2658) from the Shamrock Mine was sliced for microscopical examination. It is a light-grey rock, with numerous dark spots, elongated and oval in shape, and about $\frac{1}{8}$ inch long. On one surface, which has been weathered, they stand out above the general level. They consist of a glimmering scaly mineral. Under the microscope (slice No. 1210) the main mass of the rock is seen to be composed of minute flakes of mica, in part brown and pleochroic and in part colourless, together with some quartz and patches of a colourless mineral, which is probably cordierite. There are many black opaque spots of minute size, which are probably carbonaceous. The little mica flakes are roughly parallel, and there are a few streaks of limonite staining which extend in the same direction. The "spots" are round or elongated, according to the direction in which they have been cut. They consist of two micas, olive green and white in colour, with occasionally a little quartz. The mica flakes are considerably larger than those forming the mass of the rock. The green mica is light coloured and is pleochroic, though only to a moderate degree. There are little circular patches in it which are more pleochroic than the rest; these are probably due to minute inclusions of some mineral with radio-active properties, such as zircon. The "spots" are not much richer in carbonaceous matter than the rest of the rock.

### Dykes in the Sedimentary Rocks.

These dykes are practically always decomposed to an unctious clay, free from quartz grit, according to Mr. Whitelaw. There are, as a rule, none of the original minerals left. The resulting clay resembles the decomposed lamprophyres of Maryborough.

One specimen, labelled "dyke from auriferous reef, Queen's Gully, 100 yards west of Lane's Reef," is a porphyritic rock, now decomposed to a smooth clay with a greasy feel, through which some of the original phenocrysts are scattered in a more or less decomposed state. It is light-grey to cream coloured, and the bulk of the rock was evidently fine-grained. The most conspicuous and abundant phenocrysts are crystals of black mica, averaging about $\frac{1}{8}$ inch across; as a rule the crystal form is well developed. In addition to these there are patches of light-coloured clay, which probably represent felspars, and some patches of a mineral which resembles granular calcite in appearance, but does not give off carbon dioxide when treated with hydrochloric acid, either hot or cold. This rock is apparently a mica lamprophyre.

### The Granitic Rocks and Associated Dykes.

The granitic rocks crop out over a considerable area in the eastern portion of this survey. They extend westward along the valley of the Korong Creek as far as the township of Wedderburn, though their presence here is indicated only by a few small outcrops and by the results of boring. Mr. Whitelaw has divided these rocks into three groups—a porphyritic granite (G1) into which has been intruded an even-grained granite (G2); the third variety is decomposed to a mixture of white clay and quartz grains, and its relation to the other varieties is not clear. On microscopical examination, G1 and G2 are found to be true granites, though they contain some basic felspars which ally them to the adamellites or quartz-monzonites, the rocks forming the connecting link between the granites and the granodiorites. The granitic rock outcropping near Wedderburn township is a granodiorite.

The dykes connected with these rocks are much the same in composition as the larger masses, although in some cases the structure is different. The only exceptions observed are a quartz diorite which penetrates the true granites and a granophyre which is associated with the granodiorite. Detailed descriptions of some of the rocks are given below.

Although a careful search was made for sphene in these rocks none was observed. In this they are similar to most other Victorian granitic rocks. The absence of sphene is remarkable, since titanium in the form of titaniferous iron ore or ilmenite is so plentiful a rock-forming mineral throughout the State.

#### *Massive Rocks.*

No. 2236. Granite (G1).—Near Mt. Korong, about 20 chains south-east of trigonometrical station.—A porphyritic granite, consisting of a moderately fine-grained groundmass, through which are distributed white, simply twinned felspars. The main part of the rock consists of an admixture of quartz, felspar, and biotite, with a little white mica. The larger felspars are particularly conspicuous on the weathered surface. They sometimes contain flakes of biotite. The rock is pink in colour, probably owing to the partial decomposition of the biotite.

Under the microscope (slices 1423, 1424) the rock is seen to be holocrystalline, granitic in structure, and composed of quartz, orthoclase, microcline, plagioclase, biotite, and less abundant muscovite. The accessory minerals are apatite, zircon, and a little iron ore, which is either magnetite or ilmenite. The larger felspars are orthoclase and microcline, which occur in about equal quantities and form the bulk of the felspar contents. They include within themselves occasional crystals of the other minerals. The plagioclases are, as a rule, considerably smaller. Between crossed nicols zone structure is seen to be well developed in them. One such crystal, which is sliced nearly parallel to (010) obscures at angles ranging from 4° at the centre to 14° near the edge, corresponding to a composition varying from oligoclase to albite. The other sections observed were not suitable for exact determination, but they do not appear to be more basic. This opinion is strengthened by the fact that some of them form micrographic intergrowths with quartz. The felspars are all fairly fresh, but most of them are a little clouded from incipient decomposition. Quartz is abundant, and is of the usual granitic character; it forms possibly one-third of the whole rock. Biotite is also an abundant mineral, though quite subordinate to the felspars and quartz; it is light greenish-brown in colour, and intensely pleochroic, ranging from pale-brown to almost black. It contains numerous small zircons, which are each surrounded by a pleochroic halo which has been developed through the radio-active properties of that mineral. The biotite is in part altered to a greenish chloritic substance, which gives brilliant interference colours like those developed by muscovite. White mica is less abundant; in places it is intergrown with the biotite. The accessory minerals are all rare. Zircon is confined to the small crystals within the biotite; iron ore is represented by a few grains; and apatite occurs as small rod-shaped crystals.

No. 2237. Granite (G1).—Another sample of G1 from Block 57, parish of Korong (near north-west corner).—This specimen comes from close to the junction of G1 and G2. It is a porphyritic granite, light-grey in colour, fresh in appearance and consisting of quartz, felspar, biotite, and muscovite. Numerous phenocrysts of orthoclase occur; they range up to about 1 inch in length, are usually prismatic in habit, and are often simply twinned.

Under the microscope (slice No. 1424) the same assemblage of minerals was noted as occurs in the granite described above; but in this rock the muscovite is more abundant than biotite, and there is a little tourmaline. Both orthoclase and plagioclase show signs of decomposition; the process begins at the middle of the crystal, and gives rise to white mica and the usual dusty looking decomposition product.

No. 2656. Granite (G2).—From north-west corner of Block 15, parish of Korong.—A light-coloured granite, even in texture and moderately fine in grain, consisting of quartz, felspar, and muscovite, with a little biotite and occasional grains of tourmaline.

The microscope reveals a holocrystalline rock, granitic in structure, and composed of quartz, orthoclase, a little microcline, plagioclase, and muscovite, with a little biotite and tourmaline, and accessory iron ore and apatite in very small quantities. Quartz and felspars occur in about equal amounts, and the bulk of the felspar is orthoclase, which occasionally forms graphic intergrowths with the quartz. The plagioclase appears to be an acid variety. The felspars are clouded with decomposition products, consisting of the usual dusty looking material and white mica. The biotite is much bleached and decomposed, and what remains of it is almost colourless. Associated with the mica is the iron ore, which is brownish by reflected light, and is quite possibly a secondary mineral. The tourmaline is greenish-brown in colour.

No. 2657. Granite (G2).—From 30 chains south-east of north-west corner of Block 57, parish of Korong.—A granite, even grained, moderately fine-grained, and composed of quartz, felspar, muscovite, and biotite. The biotite is fairly abundant. It is light coloured, but stained pink with iron oxide. Occasional felspar crystals larger in size than the rest occur.

Under the microscope the rock (slice No. 1209) is seen to be holocrystalline and granitic, and composed of quartz, orthoclase, microcline, plagioclase, biotite, and muscovite, with small quantities of accessory apatite, zircon, and iron ore. The prevailing felspars are orthoclase and microcline, but plagioclase, which appears to be andesine, occurs in small quantities. The felspars are all cloudy from decomposition, and a good deal of white mica has been developed in some of them. Quartz is plentiful. The micas occur in about equal quantities and in places form parallel intergrowths. The biotite, which is light-brown in colour and intensely pleochroic, is considerably decomposed, and all stages occur from mere bleaching to complete alteration into a chloritic substance. During this process part of the iron content of the mica has crystallized out as little opaque rods of ilmenite or magnetite. The unchanged mica contains numerous minute zircons, each surrounded by a pleochroic halo. Original iron ore and apatite are both rare.

No. 2670. Granodiorite from 10 chains south-west of the Race-course, Wedderburn.—This is a granitic rock, moderately fine grained, grey in colour, and consisting of quartz, white felspar, plentiful biotite, and greenish-black hornblende. It resembles the typical Harcourt rock.

Under the microscope the rock (slice No. 1213) is seen to consist of quartz, plagioclase, a little orthoclase, biotite, and hornblende, with accessory apatite, zircon, and iron ore. The quartz is fairly abundant, and was the last mineral to crystallize out. The plagioclase is generally in the form of zoned crystals ranging in composition from labradorite to oligoclase; it forms the major portion of the rock. The biotite is plentiful, and occurs either as single flakes or in groups of flakes, and it sometimes penetrates the hornblende, or is entirely surrounded by it. It is light-brown in colour and intensely pleochroic. Inclusions within it are usually small prisms of apatite, and less commonly minute zircons. In part it is decomposed to a green chloritic mineral, which is slightly pleochroic and gives the dark indigo interference colours of pennine. Hornblende is moderately abundant, and takes the form of rude prisms. It is green in colour and pleochroic, and is frequently twinned, the composition plane being parallel to the *c* axis and bisecting the smaller angle between the prismatic cleavages. The maximum obscuration angle measured from the *c* axis is 18°. As already remarked, it encloses flakes of biotite. Apatite is moderately plentiful, and iron ore less common.

No. 2655. A crushed granitic rock from the head of Scott's Flat, and south of Hanson's paddock.—This rock has been much decomposed. It now consists of quartz, decomposed felspar, and some white mica. It is yellowish in colour, and in part stained red.

The microscope shows it to be much crushed and weathered (slice No. 1207), and in consequence it has undergone considerable mineral changes. The felspars have been entirely altered to white mica, and a cloudy substance (? kaolin). The quartz has been shattered, and many of the grains have developed optical anomalies in consequence. Some of the mica is faint-brown in colour, and probably is bleached biotite. The slice is stained with limonite, which is probably derived from the decomposition of ferro-magnesian minerals, and is traversed by roughly parallel cracks which are doubtless shear lines.

*Dyke Rocks.*

No. 2240. A granite dyke from about 20 chains south of the trigonometrical station, Mt. Korong.—This rock is very similar to the granite No. 2656 already described. It is composed of quartz, felspar, white mica, and a smaller quantity of dark mica.

The microscope reveals a holocrystalline, granitic mixture of quartz, othoclase (the predominant felspar), microcline, plagioclase, muscovite, and biotite, with some small grains of zircon enclosed in the biotite in the usual manner (slice No. 1426). The quartz contains abundant needle-like crystals, which may be apatite; it is abundant, and sometimes occurs in rounded patches completely surrounded by felspar, and also as crystals with well-marked faces. Most of the felspar is either orthoclase or microcline, and it is all cloudy on account of decomposition. The plagioclase sometimes combines albite and carlsbad twinning; one such crystal sliced almost at right angles to the lamellæ gave concurrent extinction angles of 3° and 6.5°, indicating an andesine of about the composition $Ab_7\ An_3$. The plagioclases form more or less perfect prisms, and the orthoclase and microcline are allotriomorphic. The muscovite is more abundant than the coloured mica, and occurs scattered throughout the slice. The biotite is brownish-green in colour, and is often decomposed to a green, chloritic substance which in some cases is accompanied by sagenite. The iron ores are practically absent.

No. 2241. A granite dyke from Block 184, parish of Kinypanial.—It is similar in appearance to No. 2240.

Under the microscope (slice No. 1427) it is similar to No. 2240 as far as structure and mineral composition are concerned, except that there is little or no biotite, and the plagioclase and white mica are relatively more abundant. Several plagioclases cut perpendicular to the zone (100) (001) were examined, and the maximum extinction angle was found to be 15°, indicating that the felspar is at least as basic as andesine. Some of the felspar has been replaced by secondary quartz. A peculiar feature in this rock is that the muscovite frequently encloses portions of quartz within itself, and in one instance the enclosed quartz has well developed crystal faces, both prism and pyramid. The mica is not merely wrapped round the quartz, but has grown round it, for the lines of cleavage are straight and uncontorted.

No. 1244. A large granite dyke in granite, from the south-west corner of Block 60, parish of Korong.—This rock, both in general appearance and under the microscope (slice 1429) is similar to No. 2240.

No. 2242. The specimen consists of a small dyke, 3 or 4 inches across, penetrating a granite rock. The dyke consists of a light-coloured rock of fine texture, light-grey in colour, and composed of quartz, felspar, and white mica, with occasional grains of a black mineral. On further examination it proves to be a microgranite. None of the minerals are sufficiently large to be clearly distinguished by the naked eye. The enclosing rock is a moderately coarse-grained granite, consisting of quartz, felspar, and biotite, with a little white mica.

The microlide (No. 1428) is cut across the junction of the dyke and the enclosing granite. The dyke consists of a holocrystalline, granular, even-grained admixture of quartz, unstriated and striated felspars, a little microcline, white mica, a little biotite, and a few grains of iron ore. The quartz is plentiful, and most of the felspar is probably orthoclase; it is granular, and seldom gives any indication of crystal form. There are a few phenocrysts of quartz and plagioclase. The quartz in some instances is in the form of corroded crystals. The enclosing rock is a granite, consisting of quartz, orthoclase, microcline, plagioclase, biotite, and muscovite.

No. 2671. A granophyre dyke from near the Race-course, Wedderburn; it is associated with the granodiorite outcrop. It is a light-coloured felspathic rock, consisting of an intimate admixture of felspar and quartz. To the naked eye there is no suggestion of a graphic structure.

Under the microscope (slice No. 1214) it is seen to consist almost entirely of intergrowths of quartz and microcline. These intergrowths often consist of a centre where the structure is minute, and from which it radiates in all directions, becoming more and more coarse. The compound individual thus formed is often sharply defined from those adjoining it. There is also a little orthoclase and plagioclase, and some subordinate biotite and muscovite.

No. 2238 (A). A quartz porphyry from a dyke 2 chains wide in the south-east corner of Block 56, parish of Korong.—It traverses the granite G2. It is a yellowish rock, consisting of colourless quartz grains embedded in a base of yellow felspars, which form a compact mass in which occasional crystal faces can be seen.

Under the microscope (slice No. 1425) it consists of grains of quartz and crystals of felspar, set in a groundmass of the same minerals, together with a few flakes of original white mica. It is holocrystalline. The felspars are all considerably decomposed, but evidently include orthoclase and plagioclase. They are altered to a cloudy looking substance through which are distributed small flakes of white mica.

No. 2238 (B). A quartz diorite from the same locality as No. 2238 (A).—It is quite different from any of the other dyke rocks in appearance, consisting of a fairly fine-grained, dark-coloured intermixture of red felspar and greenish-black hornblende. With dilute acid it gives off bubbles of $CO_2$, indicating the presence of calcite.

Under the microscope (slice No. 1430) it is a holocrystalline rock, formed of quartz, felspar, and hornblende, with a good deal of ilmenite and some accessory apatite. It is considerably decomposed, with the result that serpentine and calcite have been formed, and the felspars have become cloudy. The felspars are practically all plagioclase, and from the few crystals suitable for optical measurements, they appear to be andesine, or some more basic form. As a result of decomposition the felspar becomes rather opaque and pink in colour, and a granular mineral is developed which is colourless, gives bright interference colours, and has a moderate refractive index. The quartz is evenly scattered through the rock, but is not very abundant. In many cases it is bounded by well-defined crystal faces, and it is sometimes intergrown micrographically with decomposed felspar. It is quite possible that at least a part of this quartz is of secondary origin. Hornblende is the most abundant mineral after the felspars, and probably constitutes about one-third of the whole rock. It is either brown or greenish, the two colours often appearing in the same crystal, and very probably being the result of partial decomposition. It is strongly pleochroic. Occasionally it is simply twinned, the plane of composition being parallel to the vertical axis. The extinction angles in the prism zone range up to 18°. The iron ore occurs abundantly as grains; in places it is traversed by lines of white leucoxene, so that it is ilmenite, not magnetite. Apatite occurs in the form of moderately stout prisms scattered through the rock. There are also patches of calcite, which is no doubt a decomposition product from the felspars and hornblende.

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FIG. 1.—JUNCTION OF OLDER AND NEWER GRANITES, MT. KORONG.



FIG. 2.—JUNCTION OF OLDER AND NEWER GRANITES, MT. KORONG.



FIG. 1.—TORS OF THE NEWER GRANITE (G.2.), MT. KORONG.

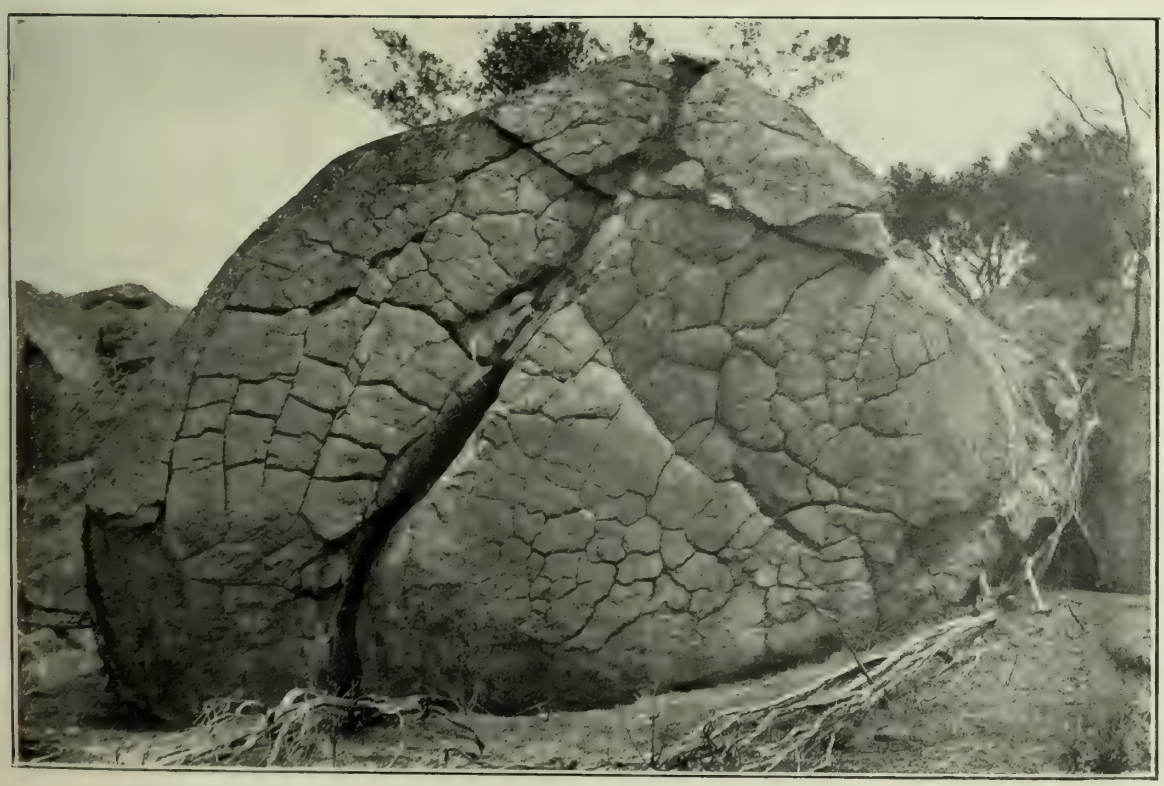


FIG. 2.—A GRANITE TOR SHOWING A PECULIAR TYPE OF WEATHERING, MT. KORONG.



FIG. 1.—ANOTHER GRANITE TOR EXHIBITING TABULAR JOINTING, SUN CRACKS, AND WEATHERING, MT. KORONG.

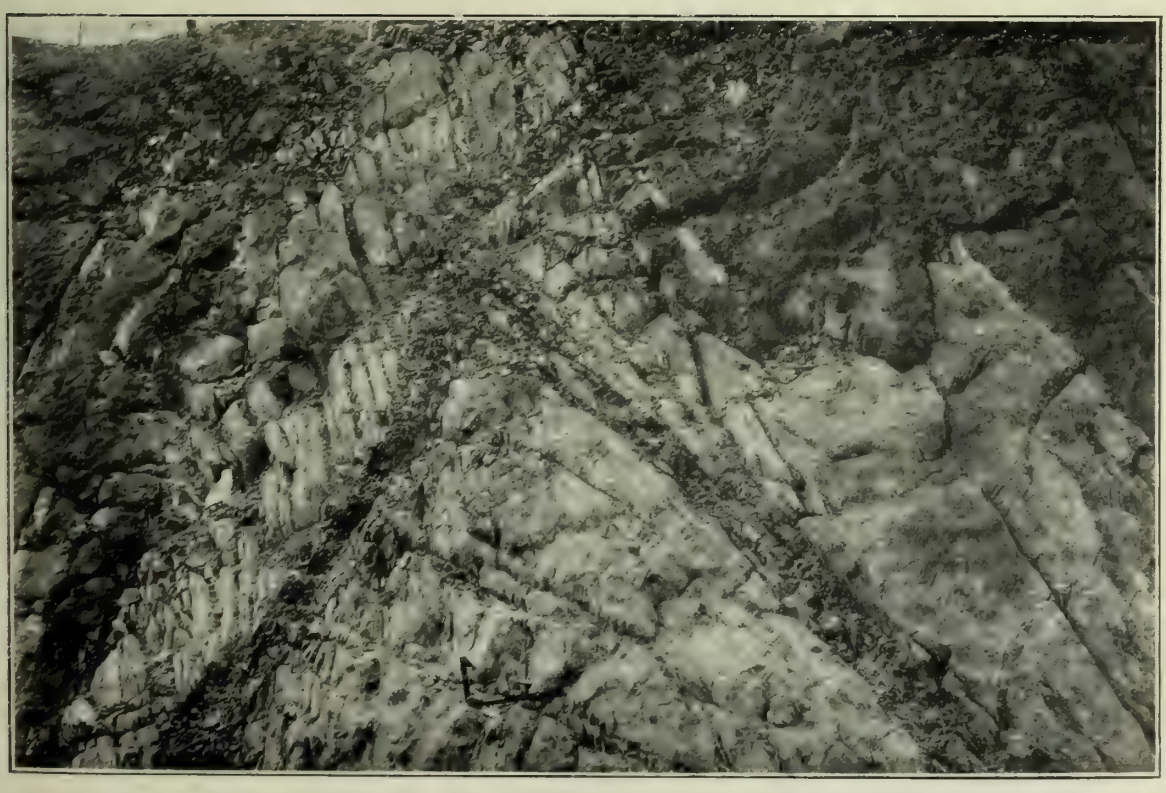


FIG. 2.—AN ANTICLINAL FOLD IN ORDOVICIAN ROCKS, NEAR WEDDERBURN RAILWAY STATION.

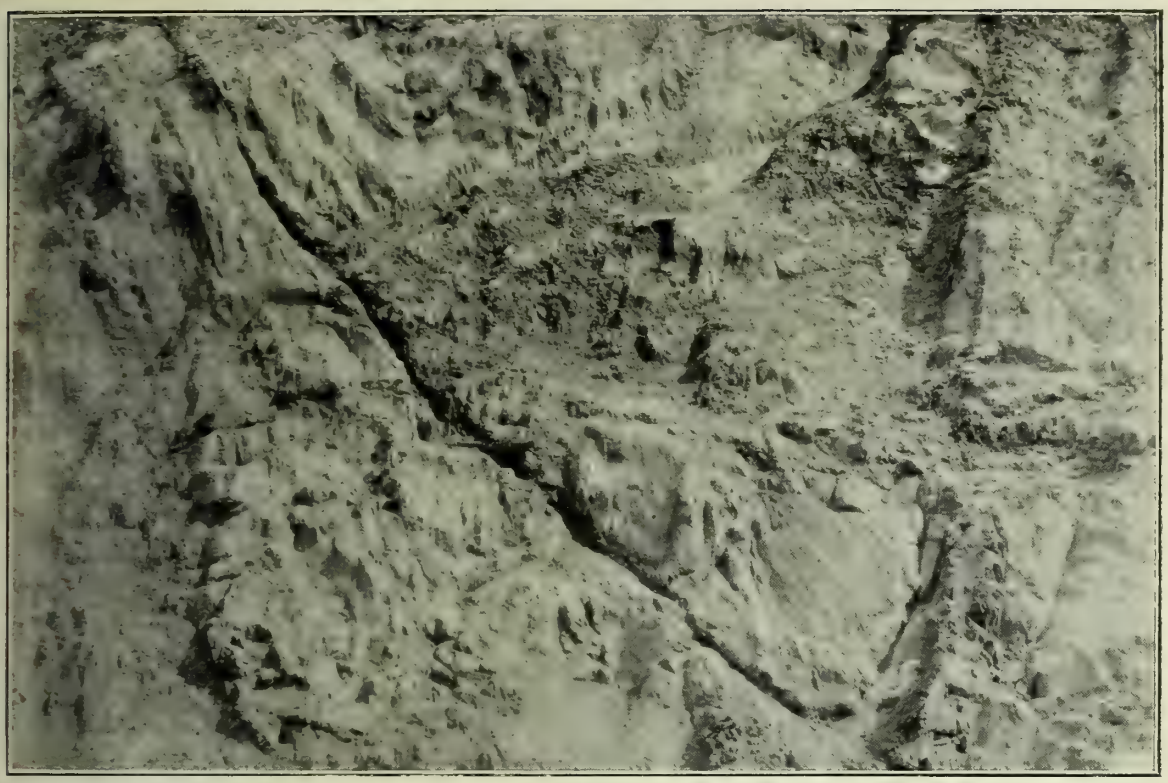


FIG. 1.—A SYNCLINAL FOLD IN ORDOVICIAN ROCKS, NEAR WEDDERBURN RAILWAY STATION.



FIG. 2.—A TYPICAL DECOMPOSED DYKE PENETRATING ORDOVICIAN STRATA, NEAR WEDDERBURN RAILWAY STATION.

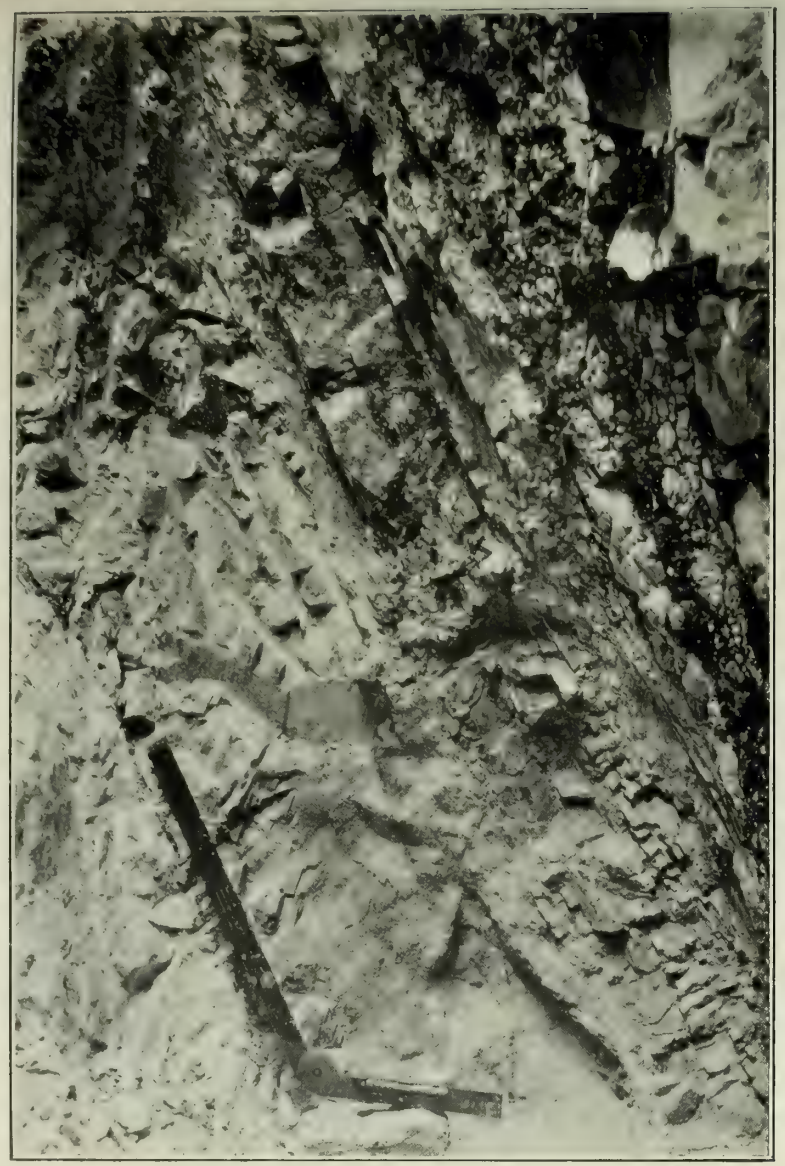


Fig. 1.—Quartz Reef in Symon's Claim, Edwards Reef, near Bocca Flat.

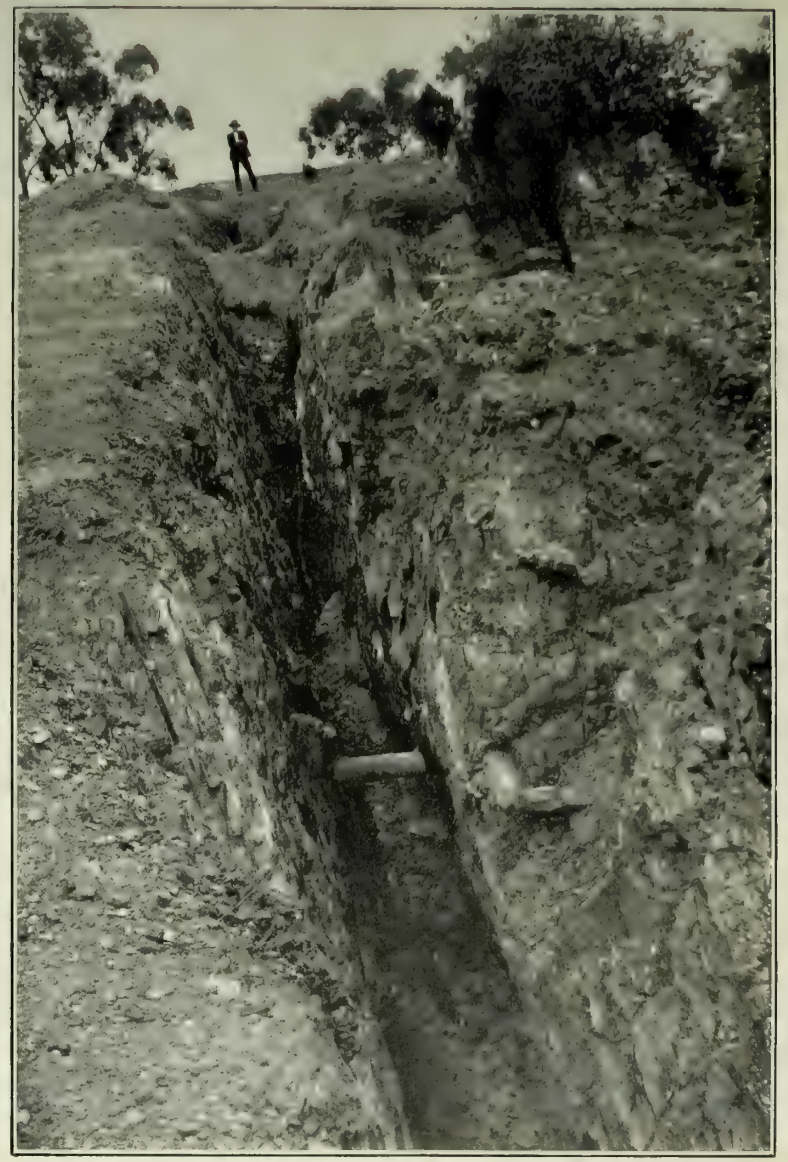


Fig. 2.—Open Stopes, Lane's Reef.



FIG. 1.—LARGE BARREN QUARTZ REEF, WHITE ROCK HILL.



FIG. 2.—LARGE BARREN REEF, HERMIT HILL.



FIG. 1.—PLIOCENE GRAVELS AND CONGLOMERATES, HARD HILLS.



FIG. 2.—CEMENTED PLIOCENE WASH, SUGARLOAF HILL.



FIG. 1.—MODEL OF 336-OZ. NUGGET FOUND AT POSSUM POINT IN 1887.

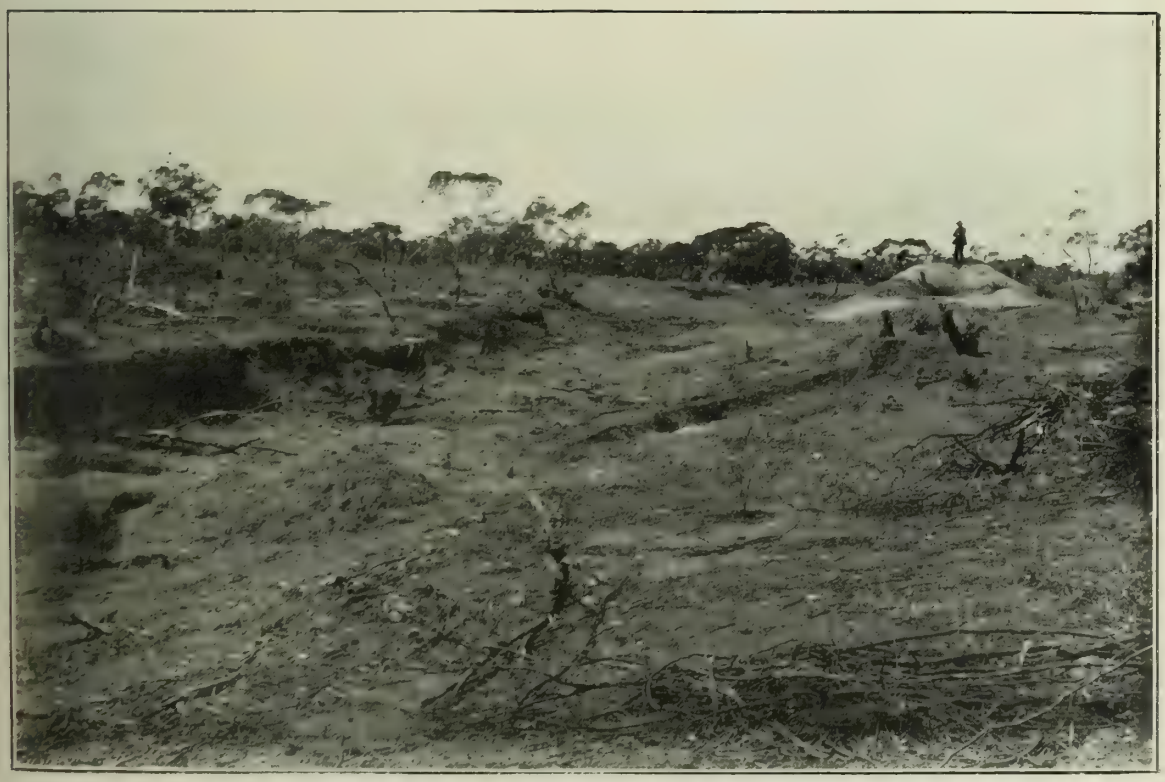


FIG. 2.—HEAD OF POVERTY GULLY, LOOKING SOUTH.

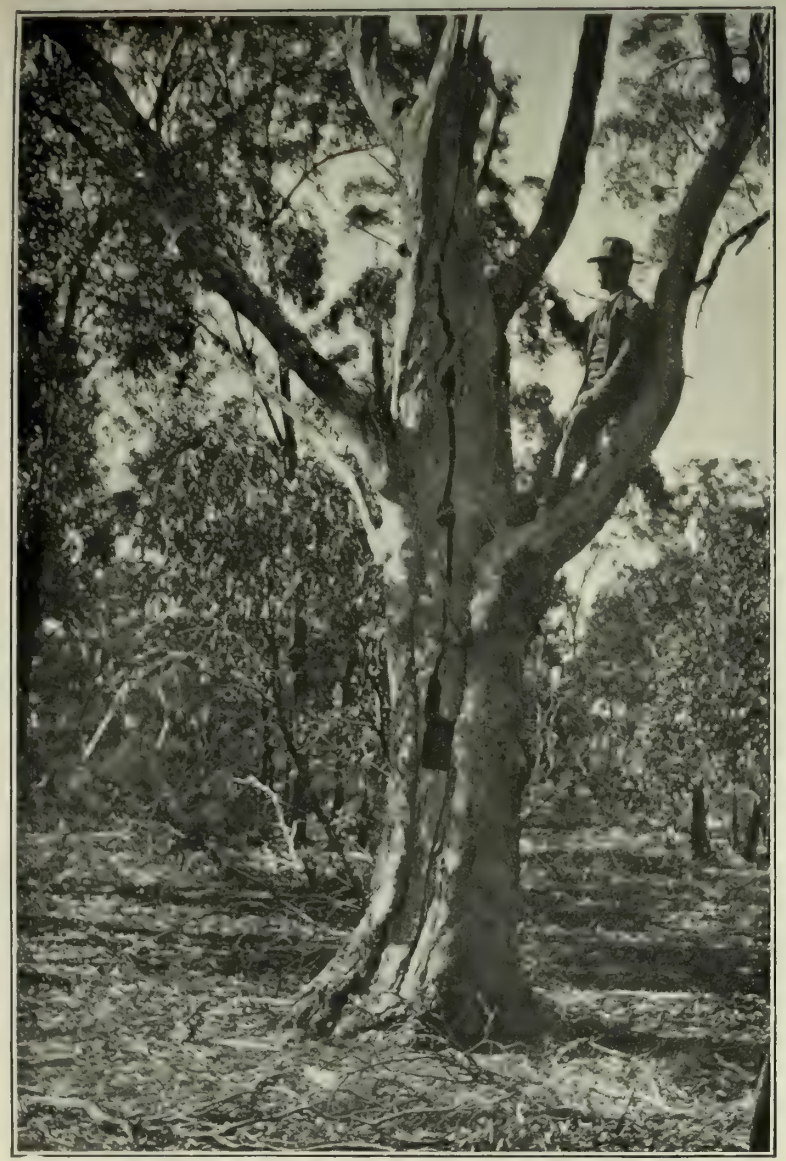


FIG. 1.—HOLLOW TREE IN WHICH HOLES HAVE BEEN CUT BY ABORIGINES WITH STONE AXES, NARDOO RANGES.

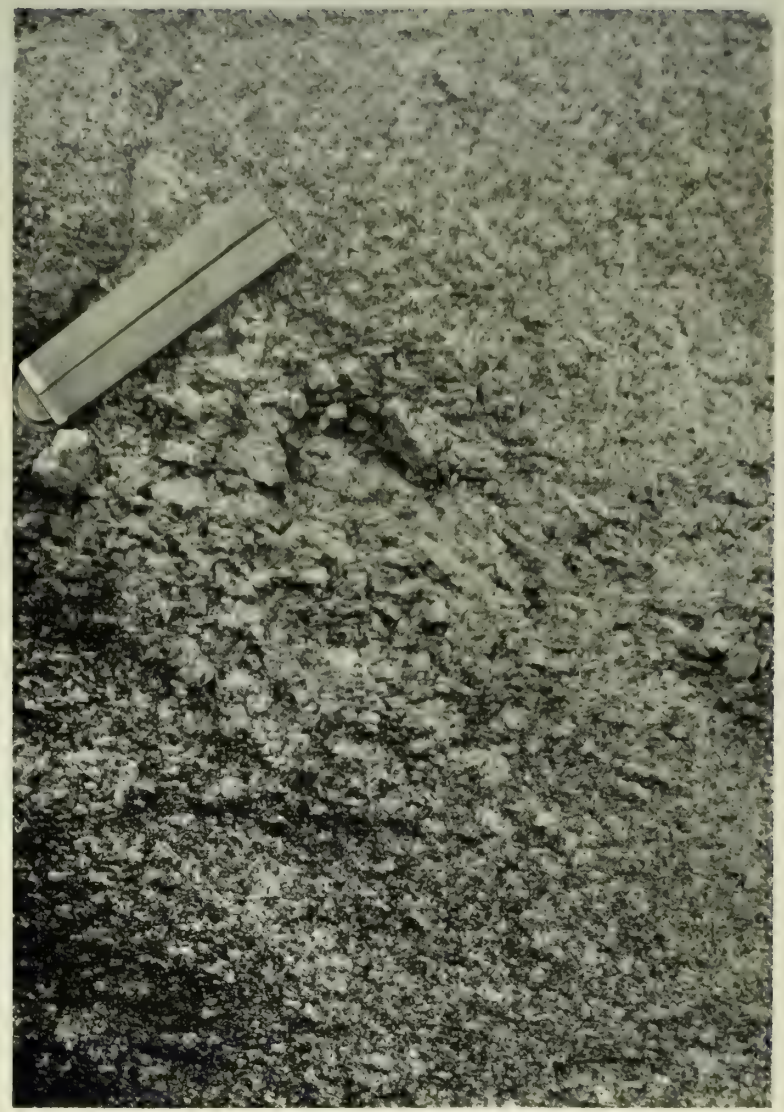
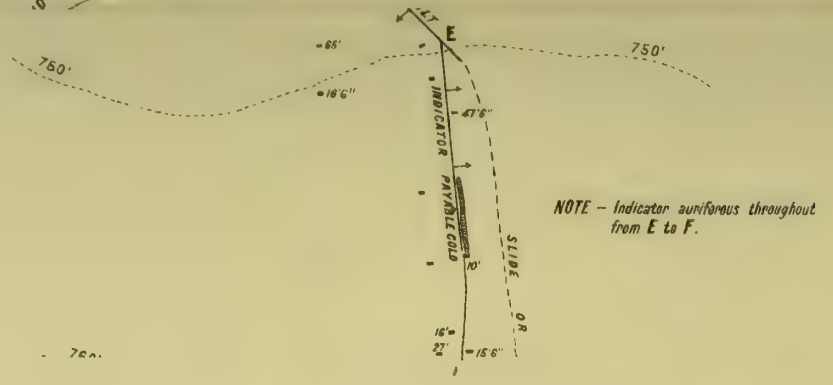


FIG. 2.—FACE OF GRANITE BOULDER SHOWING COARSE TEXTURE AND LARGE FELSPARS, MT. KORONG.

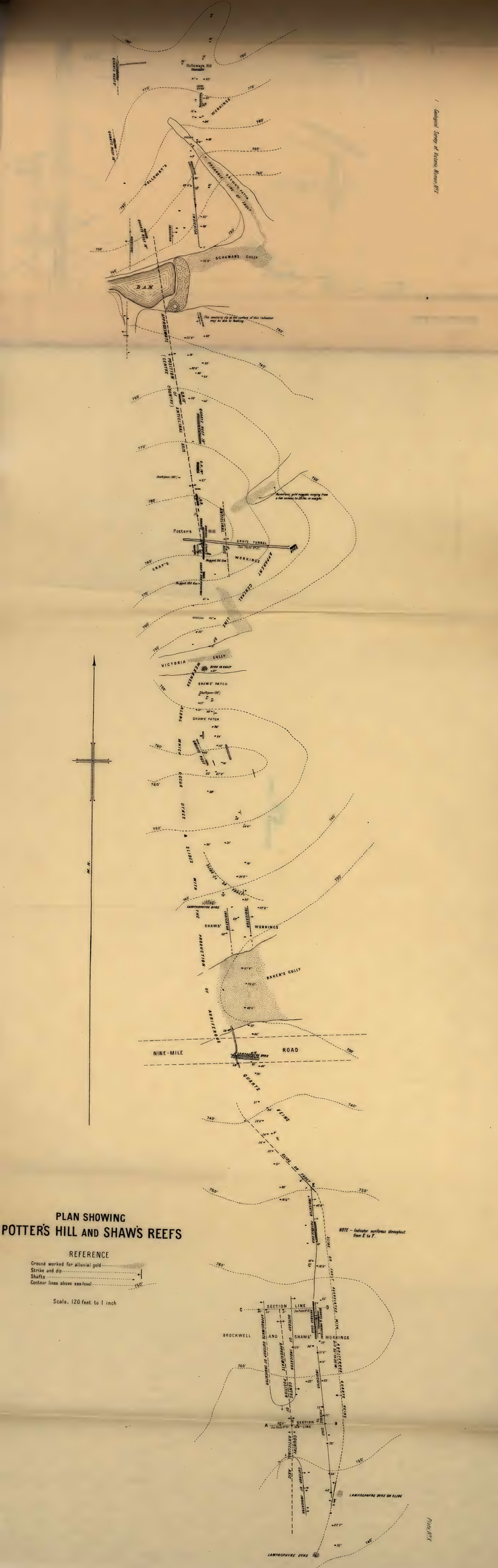
# PLAN SHOWING
# POTTER'S HILL AND SHAW'S REEFS

REFERENCE




NOTE – Indicator auriferous throughout from E to F.

Geological Survey of Victoria Memoir No X




## PLAN SHOWING POTTER'S HILL AND SHAW'S REEFS

REFERENCE

Ground worked for alluvial gold

Strike and dip

Shafts

Contour lines above sea-level

Scale, 120 feet to 1 inch

NOTE – Indicator numerous throughout from E to F.

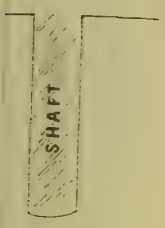
/ Geological Survey of Victoria, Mansion, M.P.

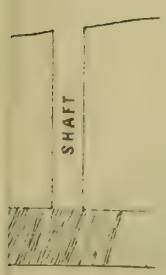
Plate, M.P.

Geology

Quartz

D



# SECTIONS ON POTTER'S HILL LINE OF REEF

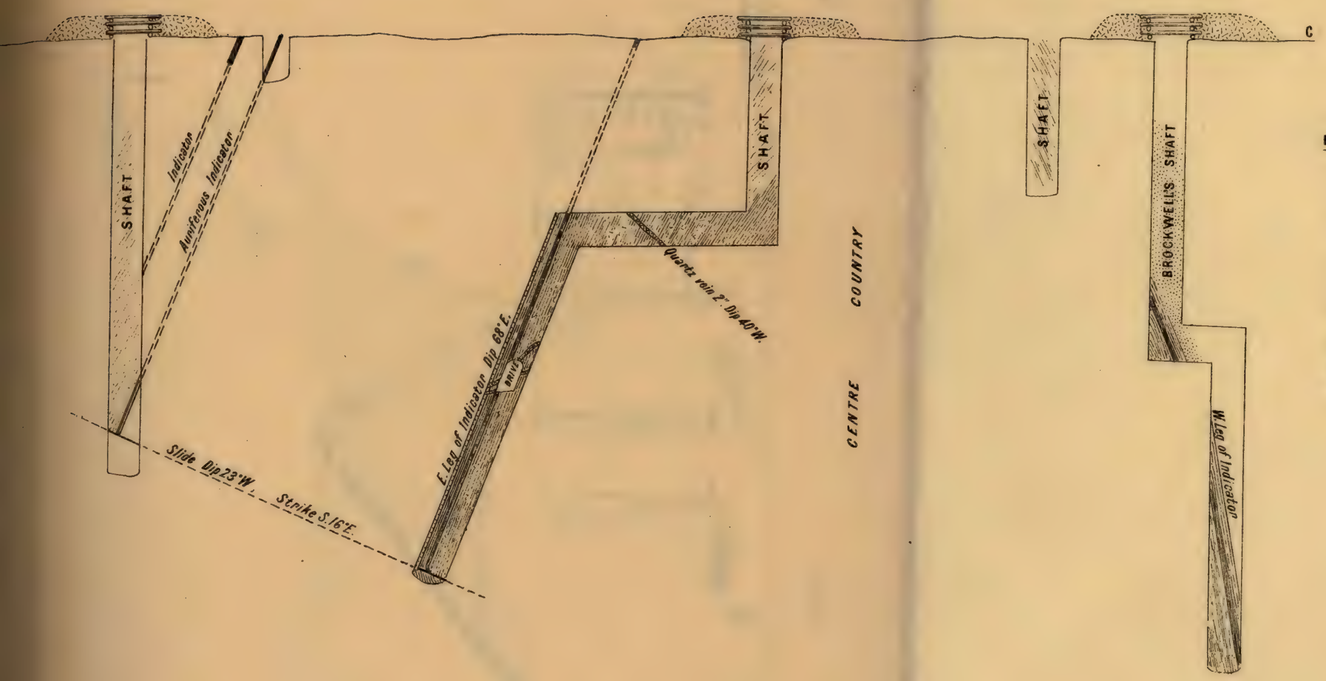
Looking South

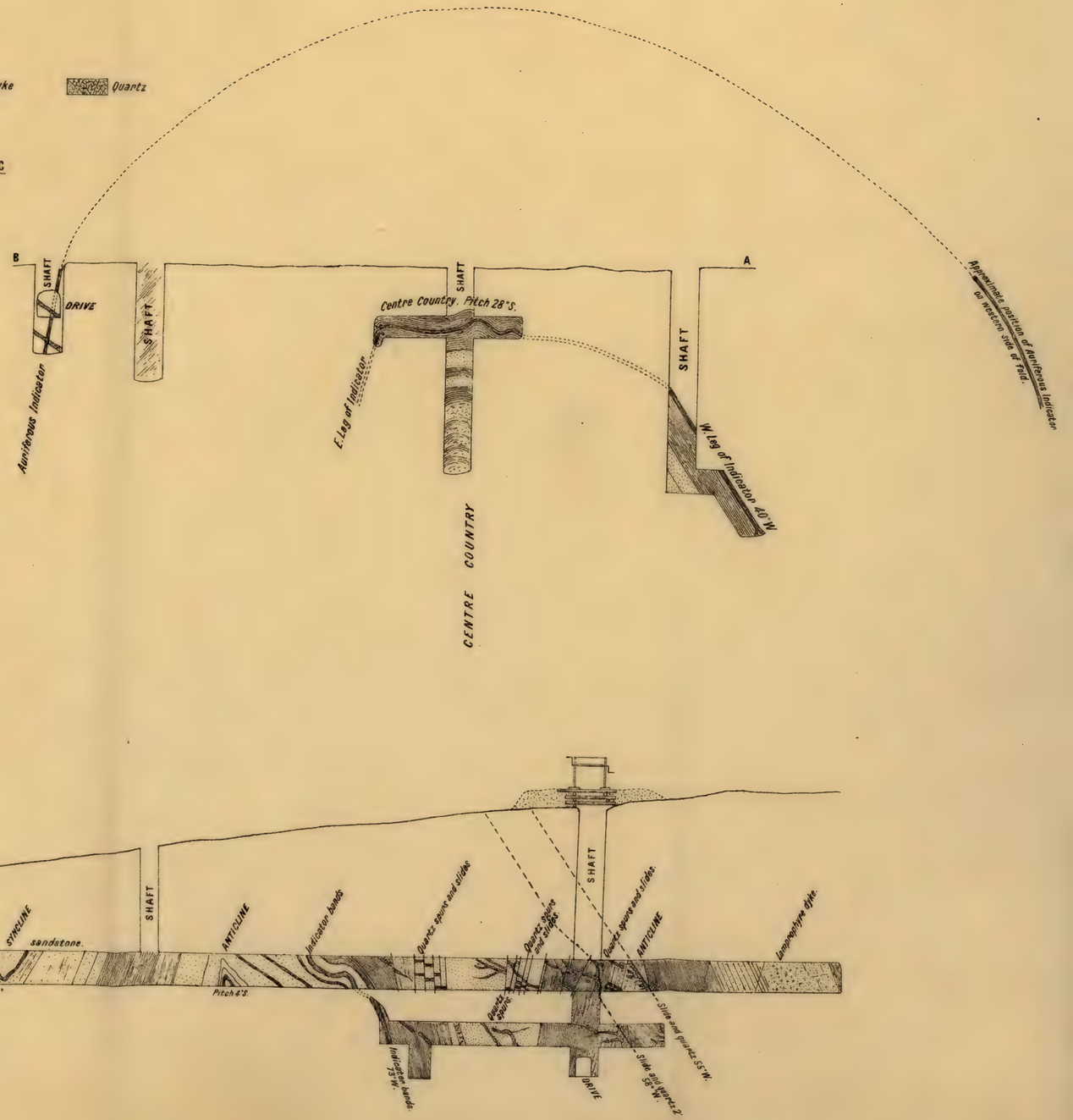
*(See Plate No X)*

Scale, 20 feet to inch

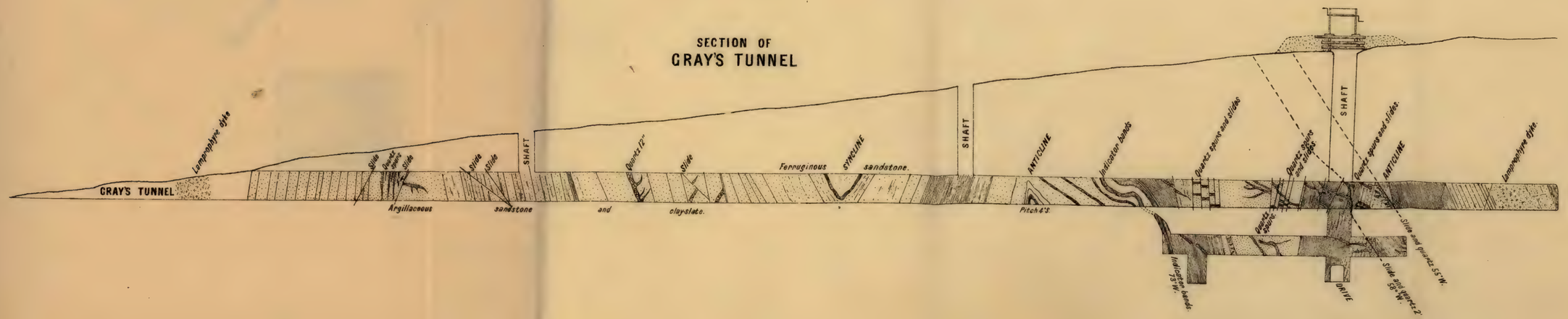
REFERENCE

Sandstone · Slate · Dyke · Quartz




## SECTION OF GRAY'S TUNNEL





# PLAN AND SECTION OF LANE'S REEF

Scale, 120 feet to 1 inch

Auriferous portions of reefs

Geological Survey of Victoria, Memoir, No X

## LONGITUDINAL SECTION

WELSHMAN'S SHAFT

DIP OF MAIN REEF

PITCH OF AURIFEROUS CHUTE

WATER

ENGINE SHAFT

STOPED GROUND

## PLAN

Welshmans Shaft

Shaft

Engine Shaft

LANE'S REEF

CENTRE COUNTRY

BAKERS REEF

Baker's Shaft

Shaft 87

Shaft 22

Shaft 71

GARDINERS REEF

AURIFEROUS ALLUVIUM

SCOTCH-JOCKS REEF

APPROXIMATE POSITION OF CENTRE COUNTRY DYKE AND QUARTZ OUTCROP

QUARTZ OUTCROP

ABANDONED

## TRANSVERSE SECTION

SCOTCH JOCK'S REEF

DYKE AND QUARTZ INTERMIXED

REEF FROM 3' TO 4' THICK

REEFING VERY FLAT

CARPENER'S REEF

ENGINE SHAFT

BAKER'S SHAFT

BAKER'S REEF

LANE'S REEF

CENTRE COUNTRY

FLAT REEF Dip 40° N.

N. W.

S. E.

## MUNICIPAL W.S. RESERVOIR

REEF

LITTLE WONDER Engine Shaft

Plate No XII.

Scale, 10 feet to 1 inch

FOLD

Engine Shaft

680'

ITCROP

700'

680'

680'

SPECIMEN HILL 705'




## SECTION G.H.

Scale, 60 feet to 1 inch.

Plate No XIII

Geological Survey of Victoria Memoir. No X

# PLAN SHOWING SPECIMEN HILL, CANADIAN, JUBILEE, AND DI MARCHI'S REEFS.

Geological Survey of Victoria, Memoirs, No X.

## REFERENCE

Auriferous portions of reefs
Ground worked for alluvial gold
Strike and dip
Contour lines above sea-level

Scale, 120 feet to 1 inch

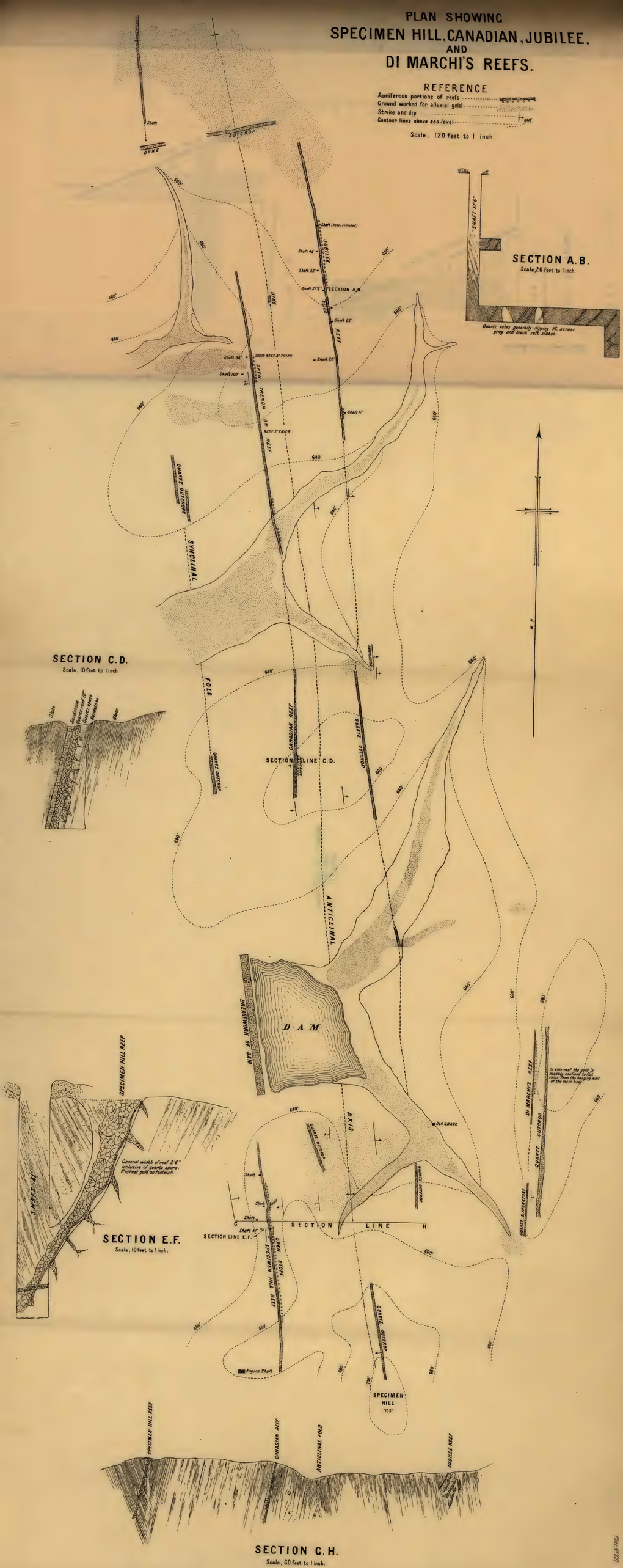


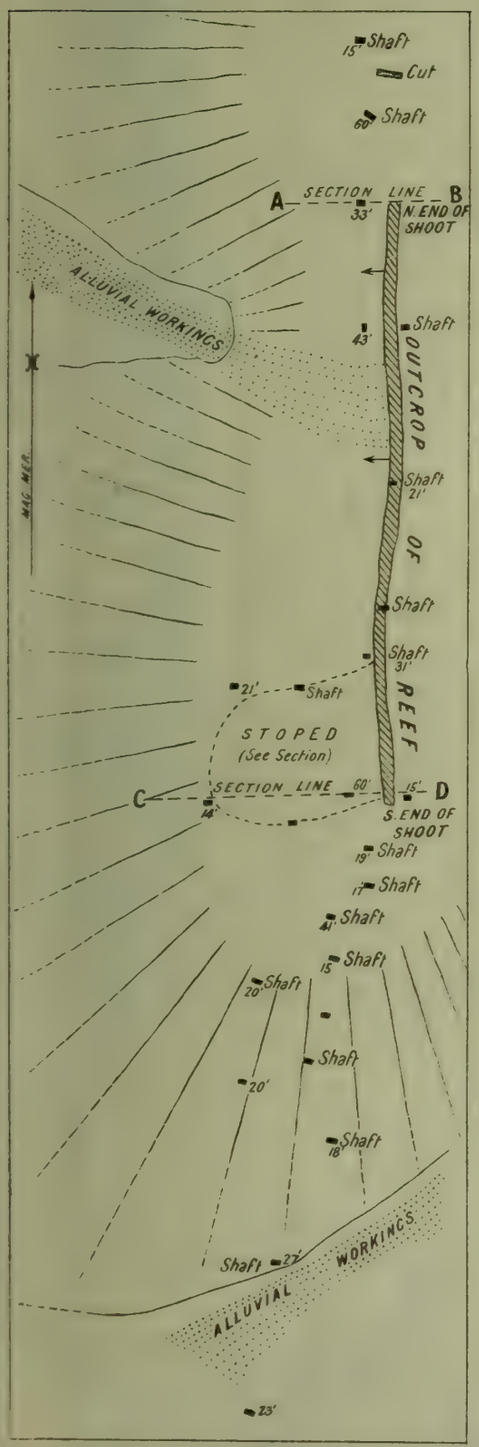

Plate XVIII

# COSH'S REEF



## PLAN

Scale-60 Ft to One Inch

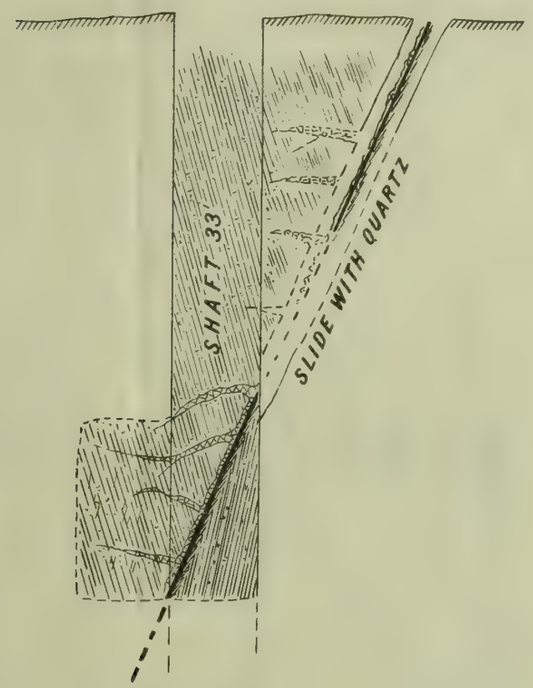



## TRANSVERSE SECTIONS

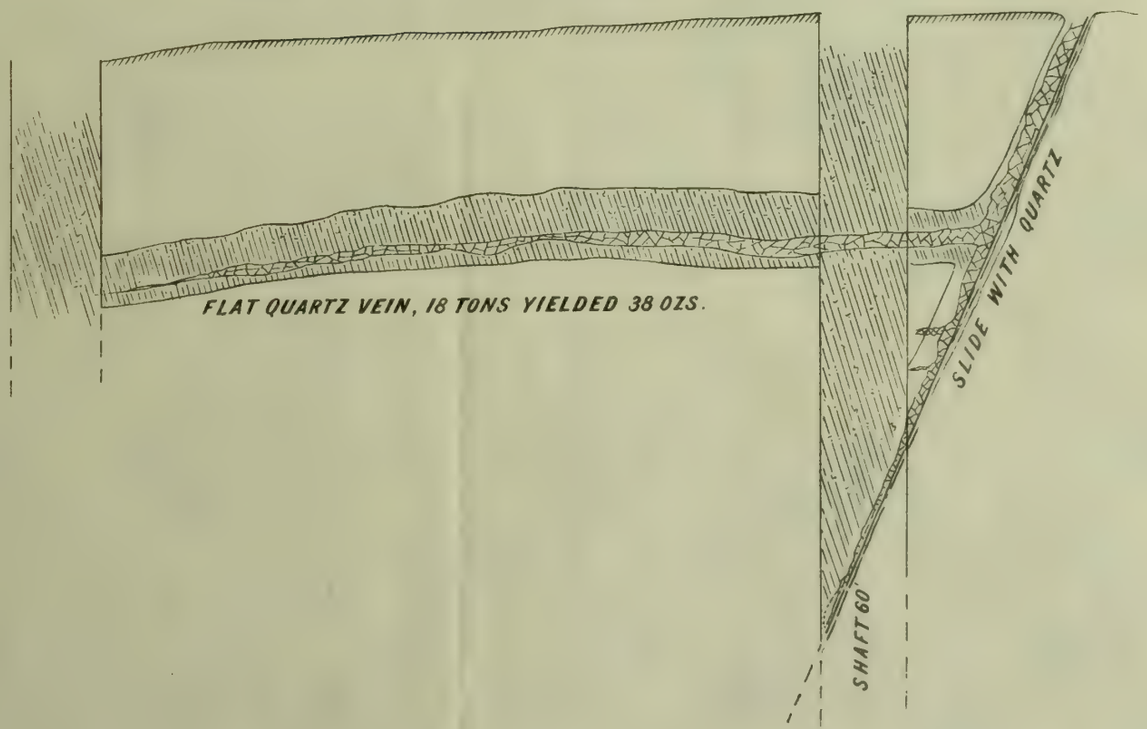
(LOOKING NORTH)

Scale -10 Feet to One Inch.

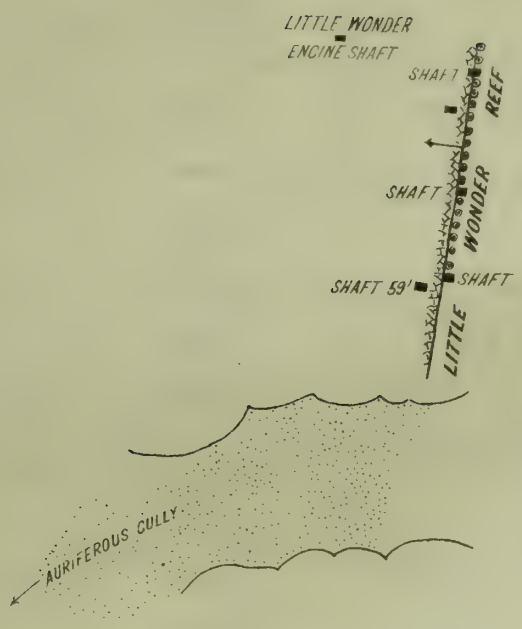
SECTION A – B




SECTION C – D








# PLAN OF

# LITTLE WONDER GOLD MINE.

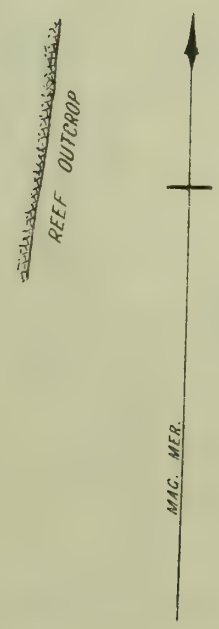
SCALE. 120 FEET TO 1 INCH.

REFERENCE.

AURIFEROUS PORTIONS OF REEFS.

WORKED GROUND FOR ALLUVIAL GOLD

STRIKE AND DIP

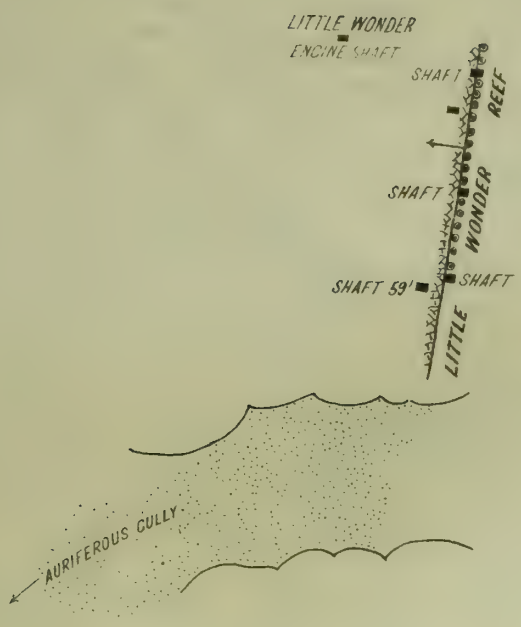






POST

POST




# PLAN OF

# LITTLE WONDER GOLD MINE.

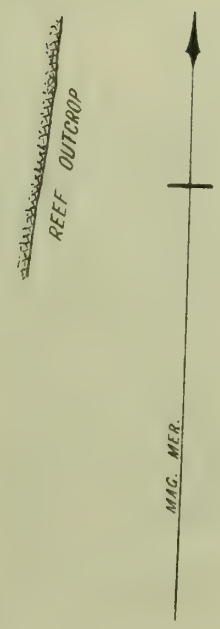
SCALE. 120 FEET TO 1 INCH.

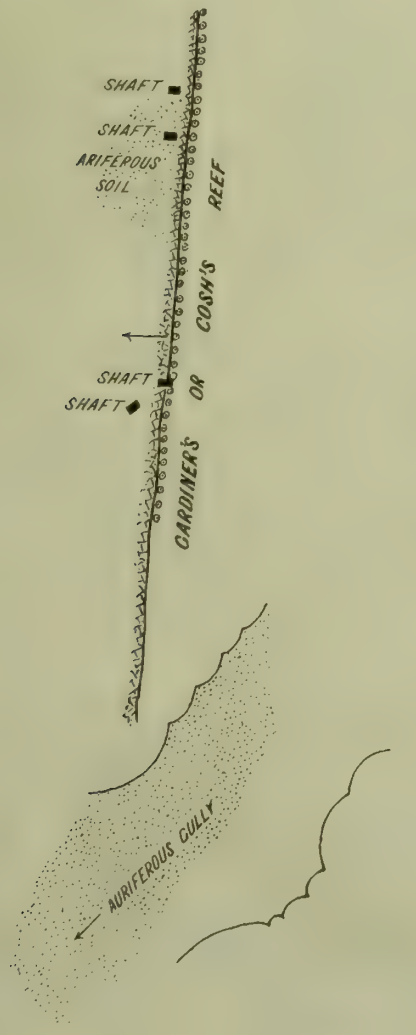
REFERENCE.

AURIFEROUS PORTIONS OF REEFS.

WORKED GROUND FOR ALLUVIAL GOLD

STRIKE AND DIP




• POST

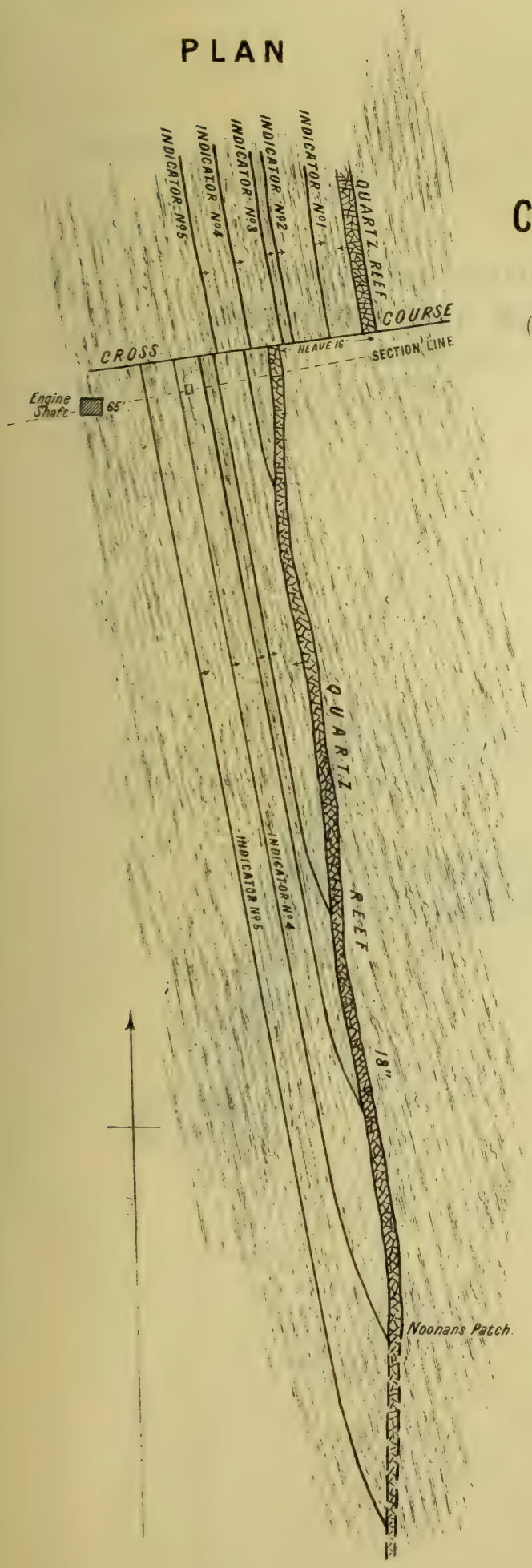
• POST

# CHAMPION REEF

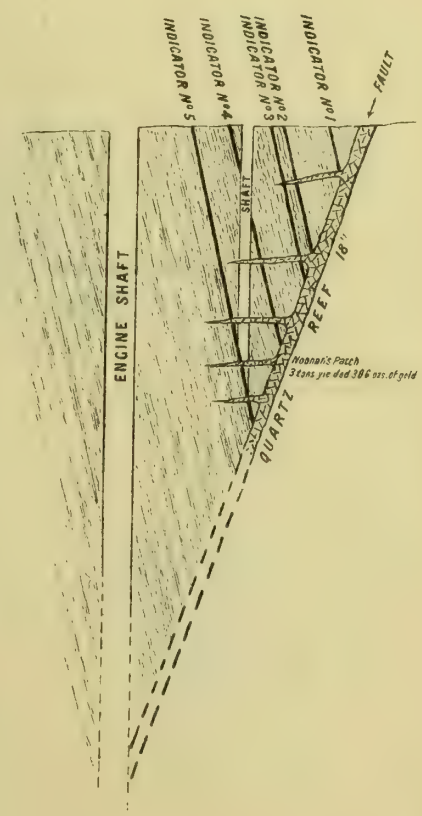
Scale-30 feet to 1 inch

(Drawn from sketch and information)

## PLAN



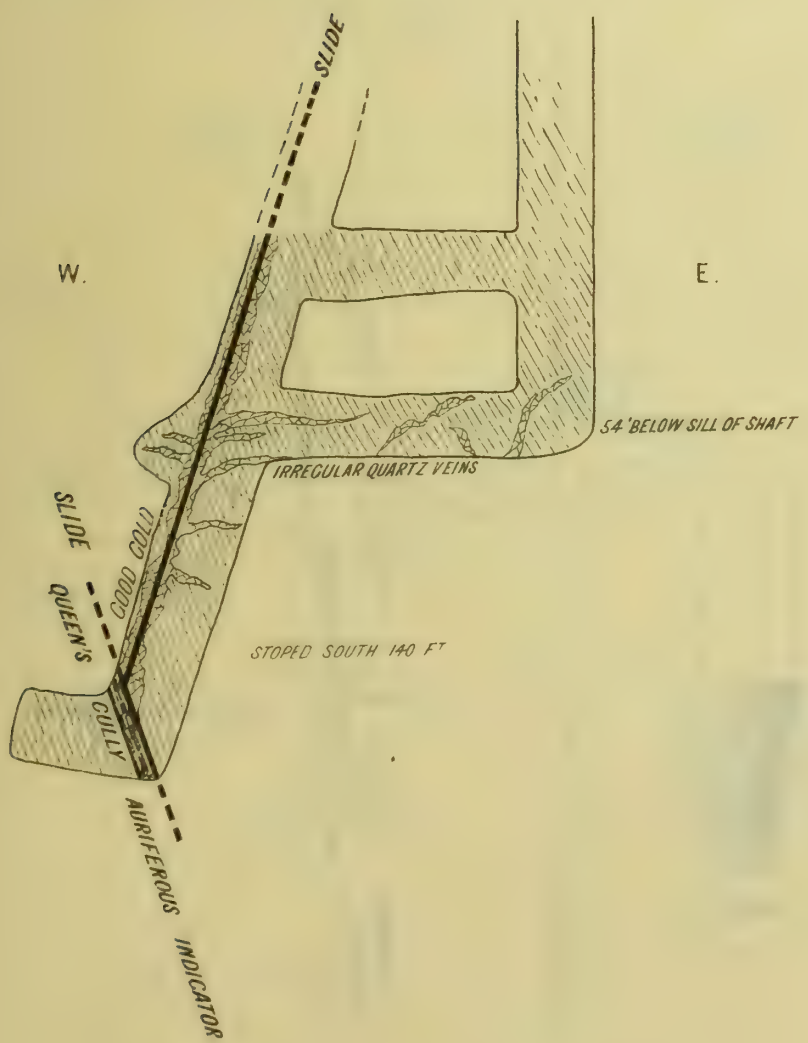

## TRANSVERSE SECTION



# TRANSVERSE SECTION OF
# CAMERON'S REEF, BOCCA FLAT.

(LOOKING NORTH)

Scale — 10 Feet to 1 Inch.

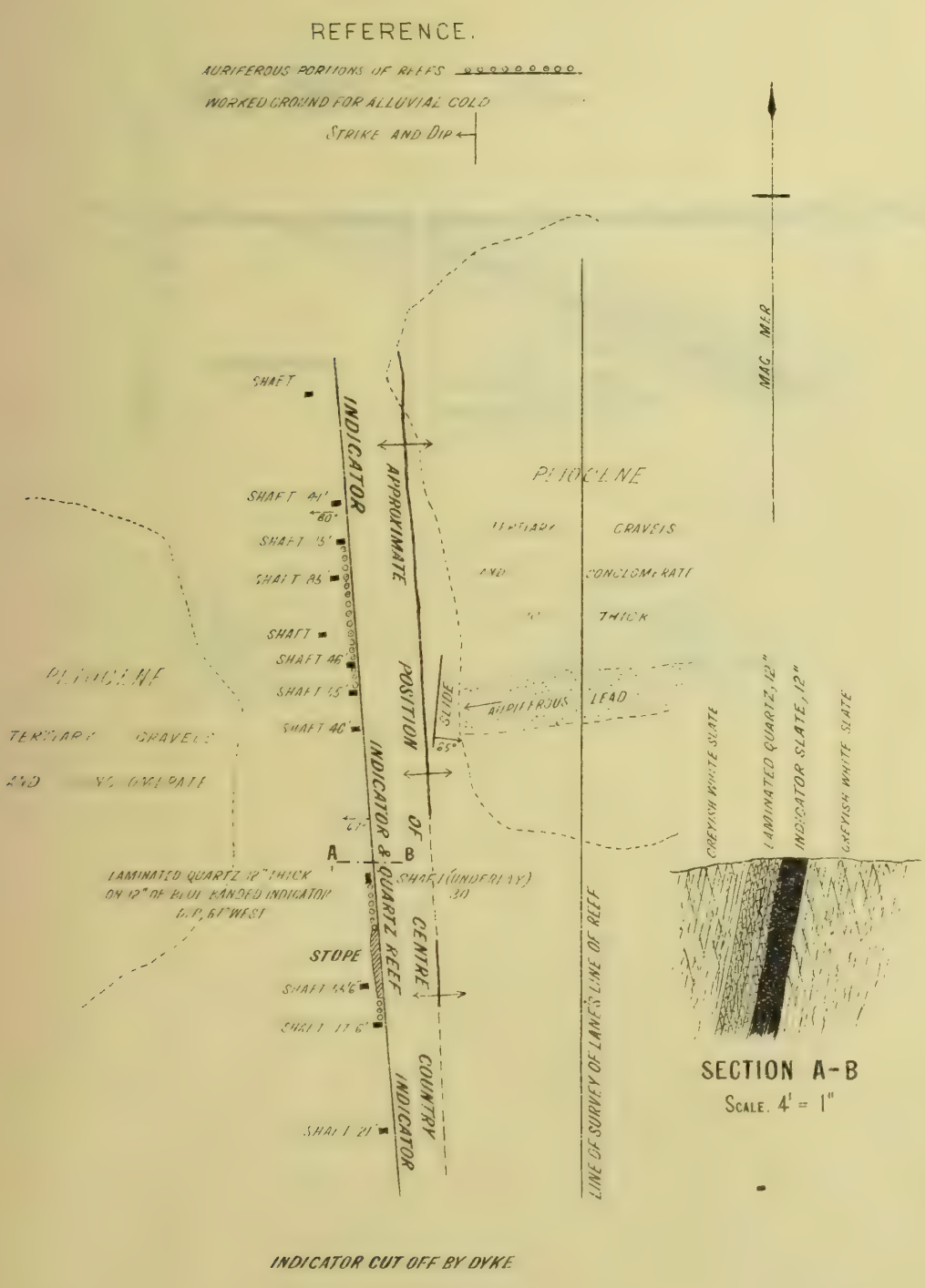




# PLAN OF

# EDWARDS & SYMON'S REEF

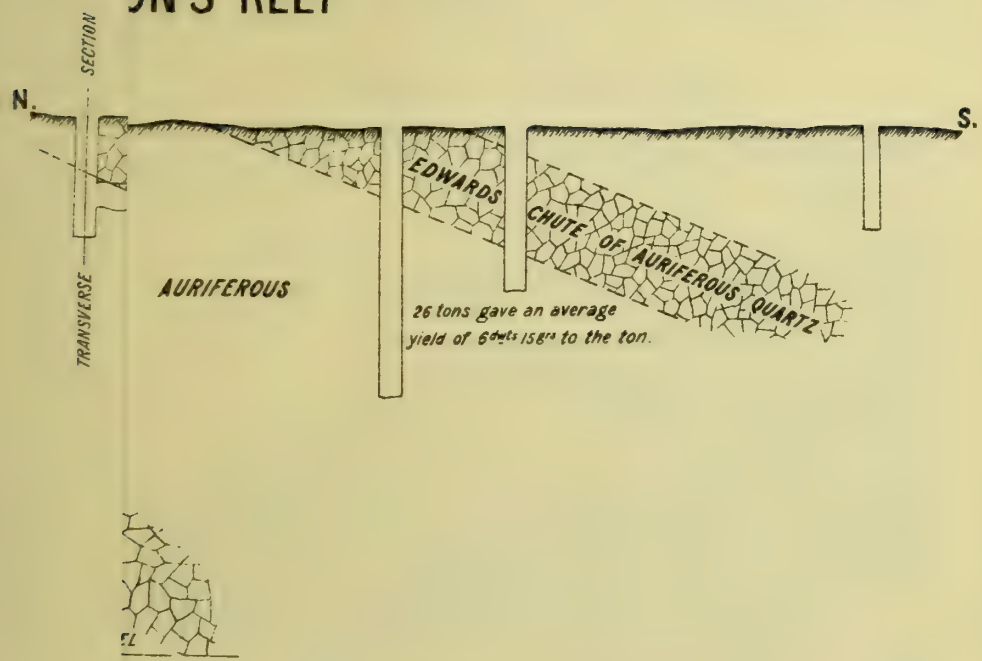
SCALE 120 FEET TO 1 INCH




INDICATOR CUT OFF BY DYKE



# ON'S REEF


SECTION
N.
S.
TRANSVERSE
AURIFEROUS
EDWARDS
CHUTE OF AURIFEROUS QUARTZ
26 tons gave an average
yield of 6ozs 15grs to the ton.




# LONGITUDINAL SECTION OF EDWARDS AND SYMON'S REEF

SCALE
FEET 20 10 0 20 40 60 FEET

N. SECTION TRANSVERSE S.

AURIFEROUS SLIDE REEF NOT PAYABLE BELOW SUPPOSED SLIDE

SYMONS CHUTE OF PAYABLY AURIFEROUS QUARTZ

CEMENTED Stoped

PLIOCENE WASH

10 Tons yielded from 6 dwts to 19 dwts to the ton

NOT PAYABLY AURIFEROUS QUARTZ

WATER LEVEL

EDWARDS CHUTE OF AURIFEROUS QUARTZ

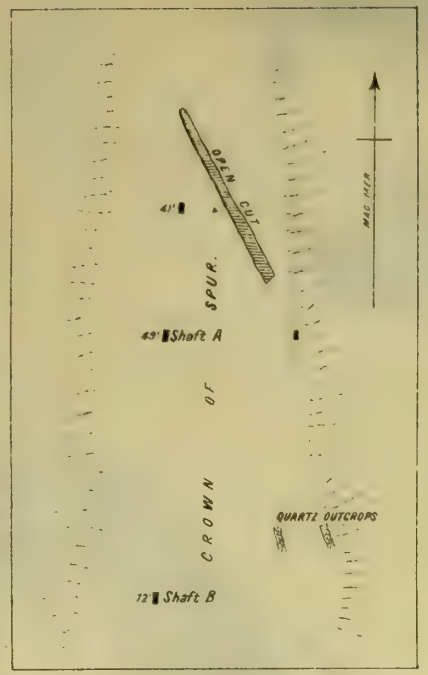
26 tons gave an average yield of 6 dwts 15 grs to the ton.

TRANSVERSE SECTION
Looking N.

SCALE
FEET 10 5 0 10 FEET

REEF BETWEEN INDICATOR.

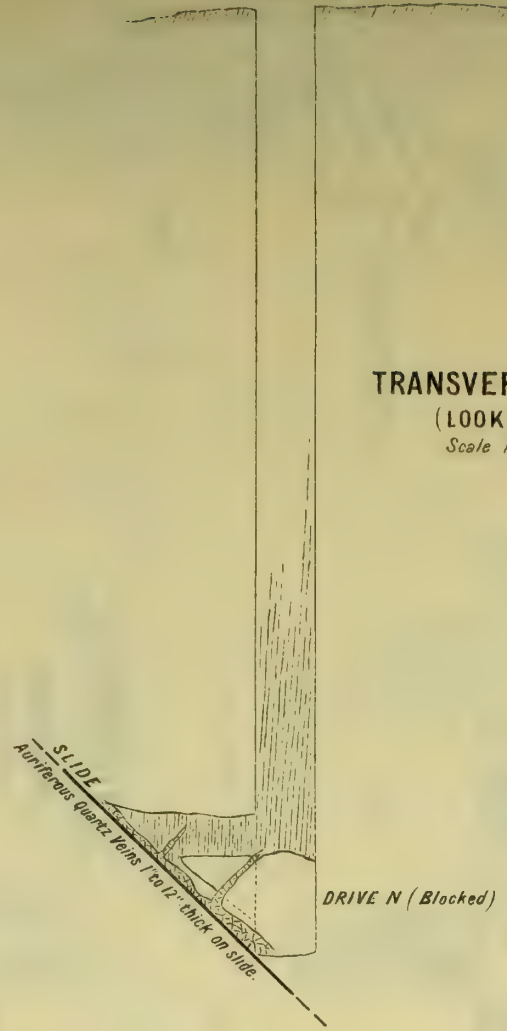
FAULT




PLAN

Scale - 60 feet to 1 inch

SHAFT A.

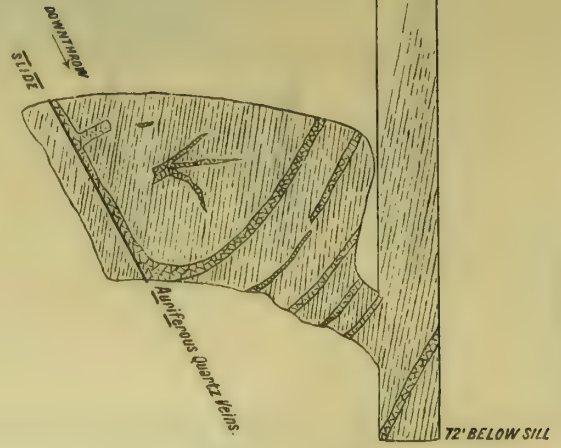



TRANSVERSE SECTIONS

(LOOKING SOUTH)

Scale 10 feet to 1 inch

SHAFT B.




# ANNIE JONES REEF

Geological Survey of Victoria, Memoir No. X

XX. 21. 14

ANNIE JONES REEF

# FORDS REEF



## ONE TREE HILL WORKINGS

TRANSVERSE SECTION

ARENACEOUS SLATE

SCHISTOSE SLATE

Fig.1.

STOPED

Irregular quartz veins in fractured schistose rock

Dip 78°E.

INDICATOR

Dip 68°E.

DRIVE

Auriferous quartz 6 tons yielded 14 ozs 8 dwts

6" Quartz

FACE OF DRIVE NORTH

TRANSVERSE SECTION

Slate

N

S

SKETCH PLAN

DYKE

25 tons stoped here averaged 1oz. of gold per ton

DYKE

Quartz veins

DRIVE.

Quartz leaders.

Fig.2.

## ECLIPSE REEF

TRANSVERSE SECTION

STOPE

SLIDE

Auriferous quartz vein

Auriferous quartz veins.

Auriferous quartz veins.

DRIVE NORTH

PUG SEAM

BEDS VERTICAL

IRONSTONE VEIN

Fig.3.

Scale – 10 feet to 1 inch
Looking North

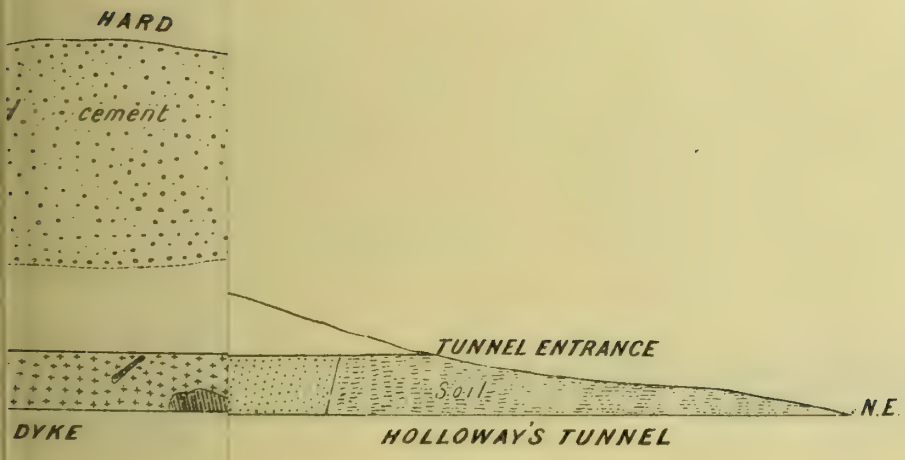
Plate N° XXII.

# ECTION OF

ENE GRAVELS .

CONTAINED L

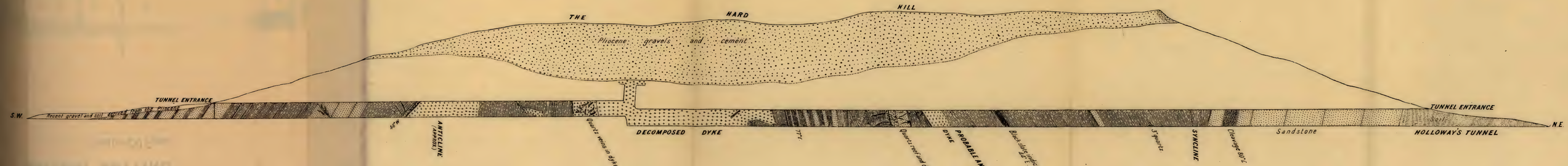
Scale-



# TRANSVERSE SECTION OF HOLLOWAY'S TUNNEL, HARD HILL

*SHOWING PLIOCENE GRAVELS AND CEMENT AND ORDOVICIAN BEDS WITH CONTAINED DYKES AND QUARTZ REEFS.*

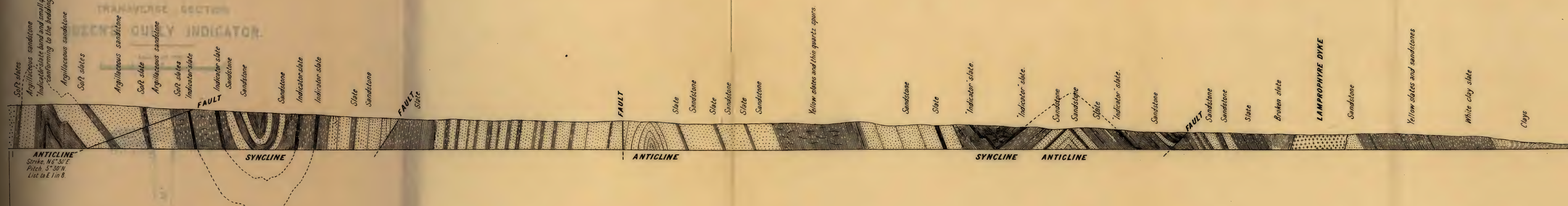
*Scale - 20 Feet to One Inch.*



Plate, N° XXIII.

# NEAR WEDDERBURNE RAILWAY STATION.

to One Inch. ———

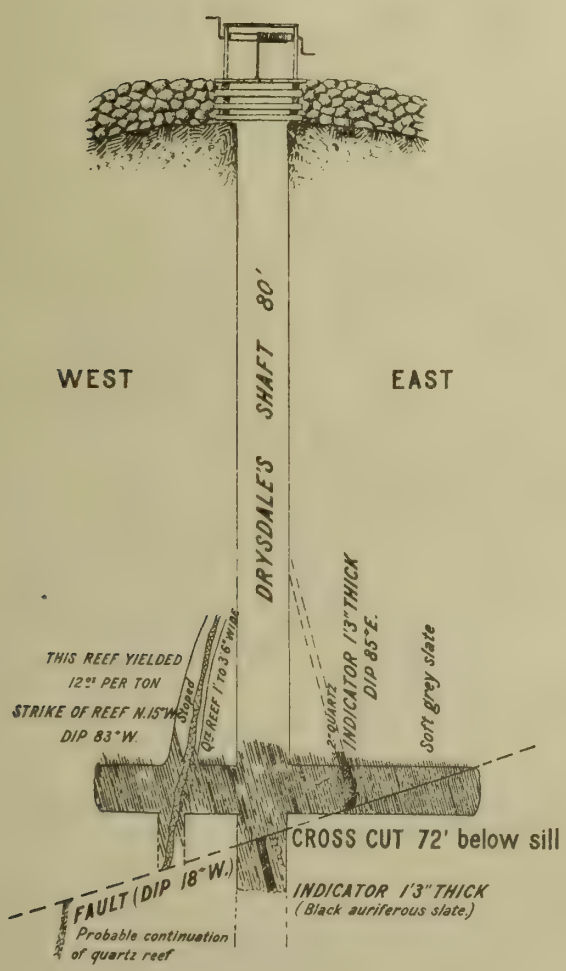


# TRANSVERSE SECTION

# QUEEN'S GULLY INDICATOR.

SCALE OF FEET:

10 0 10 20 30





61-m
R

1913.

VICTORIA.

DEPARTMENT OF MINES.

# MEMOIRS

OF THE

# GEOLOGICAL SURVEY OF VICTORIA

(H. HERMAN, B.C.E., F.G.S., Director),

ISSUED BY

W. DICKSON, SECRETARY FOR MINES, UNDER THE AUTHORITY OF THE HON. A. A. BILLSON, M.P., MINISTER OF MINES.

## No. 11.

# THE MARYBOROUGH GOLD-FIELD,

*A Report Descriptive of Quarter-Sheet No. 42B, S.W., with 7 Plates, and 24 Figures,*

BY

A. M. HOWITT.

(WITH PETROGRAPHICAL NOTES BY D. J. MAHONY, M.Sc., F.G.S.)

By Authority:

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15101.—[PRICE, 1s. 6d.

Geological Survey Office,

Talbot, 30th April, 1909.

Sir,

I have the honour to submit the following Memoir on the Maryborough Gold-field. The geological, mining, and general features dealt with are those in the area contained in Quarter-Sheet No. 42B S.W., which detailed geological map is for separate issue. Maryborough is essentially a field where dykes have an important bearing. Lamprophyre dykes, with extensive lateral and horizontal offshoots cutting the quartz reefs and the strata nearly at right angles, occur in the Western dyke belt. Many of the lamprophyre dykes are of special importance, since they are directly associated with the auriferous quartz reefs. The indicators have been dealt with and the belts of varying reef structure defined.

During the survey I received every assistance from the Mine Managers and those interested in mining, and my special thanks are due to Messrs. Clarence Smith, G. Edwards, J. Laidlaw, Ivor Davies, J. Ellery, P. J. Kennedy, J. Williams, W. Nicholas, and I. M. Chadwick.

I also desire to express my appreciation of the services of the late P. J. Lacey, who assisted me as chainman on the survey and in the compilation of the gold yields.

I have the honour to be,

Sir,

Your obedient Servant,

A. M. HOWITT.

W. Dickson, Esq.,

Secretary for Mines,

Melbourne.

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# THE MARYBOROUGH GOLD-FIELD.

## I.—POSITION AND TOPOGRAPHY.

The country embraced in the Maryborough Quarter-Sheet, No. 42B, S.W., is situated in the centre of an extensive alluvial and quartz mining district, lying between the granitic areas of Craigie–Majorca on the south-east, and Mount Hooghley–Bet Bet on the north-west.

It forms part of an extensive auriferous area, having the Amherst–Talbot–Clunes gold-fields to the south, and the Dunolly–Moliagul gold-fields to the north.

The chief town and main centre of population is Maryborough, which ranks amongst the largest in the State of Victoria; it has a population of about 6,000, and is one of the most important railway centres, lines trending from it to the four points of the compass.

Situated 92 miles from the coast and 20 miles north of the Main Divide, at an elevation of 787 feet above sea-level, it enjoys a healthy climate, which is extremely mild during the winter months, being well sheltered by the ranges to the south.

Several smaller towns, such as Timor, Alma, &c., lie within the area geologically surveyed, which covers 70 square miles and embraces the parishes of Wareek, Maryborough (in part), and small portions of the parishes of Bet Bet, Rathscar, and Bung Bong.

The eastern portion of this area is low hill country, the elevations rising 850 feet to 900 feet above sea-level, and on the average being about 100 feet above the adjacent valleys, which are known as Four-mile creek, Chinamen's Flat, Timor Creek, and Moonlight. The western area shows a variety of topography; in part it is similar to the eastern hill country, but on the extreme west and north a basalt flow occurs, in part covered by deposits of Post Pliocene age, the two forming an extensive plain through which the Bet Bet Creek winds a sinuous course; it passes through the south-west corner of the surveyed area towards the north-east, and all the other valleys and water-courses are tributaries to it. Eventually the Bet Bet joins the Loddon River at Eddington.

The greatest elevations occur to the north-west and are formed of metamorphic rocks, which have naturally withstood the weathering of ages better than the unaltered Ordovician beds. Here, on the Black Range, aneroid heights were taken, showing elevations of over 1,100 feet above sea-level.

Throughout the Lower Ordovician areas, the ridges and spurs are more or less covered with soil, especially where the softer series of beds occur. Weathered quartz veins are marked by much scattered quartz amongst the surface soil.

Throughout the slate and sandstone areas quartz veins are numerous, and in a number of places have proved highly auriferous. A network of small rich alluvial leads rising among the quartz reefs together with the celebrated deep leads, have yielded great wealth in the past. They mark the extensive rushes of the earlier days.

## II.—HISTORICAL SKETCH.

Maryborough, once the site of a sheep and cattle run, has in a little over half a century become one of the important centres in Victoria, and is now a large stately township, the main outlet for an extensive mining and agricultural district.

Early historical notes are to be found in Brough Smyth's *Gold-fields of Victoria* (1869), and Wraggs' *Reminiscences of Early Maryborough.** These show that the first small rush occurred prior to June, 1854, at a locality now known as White Hills, which lies a little to the north-east of the township; there were only a few prospectors, and they obtained fair yields, with occasional small nuggets, ranging from 1 oz. up to 10 ozs. (June, 1854).

The next discovery was at a site about 2½ miles from the present township, and here rich wash and large nuggets were found. A rush followed, and Maryborough grew rapidly; 30,000 men are said to have been on the field between June and September, 1854. Almost simultaneously rushes were opened at Main Lead, Blackman's Lead, and California Gully, besides the first small rush to Chinamen's Flat. After this boom the population began to diminish; but new discoveries, first at Adelaide Lead and shortly after at Alma, gave the town a fresh impetus, and it still remained the chief centre of business in the district (December, 1854). For the discovery of Alma, a reward of £300 was divided by W. Pierce and T. Ritchie.

Whilst thousands of miners were working on the Alma, Balaclava, and adjacent leads, there were new rushes to the east of Maryborough township in the shallow leads trending east towards the Deep Creek valley, such as Madman's, Schicer, Blucher's Leads, &c., all very rich, but narrow.

At the end of two years, however, Maryborough was almost deserted, but rich finds at Chinamen's Flat once more attracted population. During this rush, which embraced several miles of country, the rich gold-bearing quartz reefs were first discovered.

About this time the first land sale took place, and some of the miners settled along the Bet Bet valley as far as Grant's Bridge, forming permanent aid to the support of the town. From this time on its position gradually improved.

Then followed the discovery of the continuation of the Main Lead, which had been lost for some years; it was now worked to Havelock, where a further cessation occurred until recent years, when the Main Leads Companies worked the lead onward to the Bet Bet valley.

---

* Printed by the *Maryborough Advertiser*.

The last rushes at Chinamen's Flat and Havelock marked the turning point of Maryborough's prosperity, for machinery was introduced to work the deeper and wet ground, which has since proved so remunerative. In 1856, Mr. Alexander Watson formed a party to work the wet ground, and, after a few failures, at last achieved success at the Old Perseverance, which was the starting point of the deep alluvial mining. Numerous other claims were developed and paid handsome dividends in many cases. Then followed the development of the deep ground at Alma, the Seaham mine being exceptionally good, and then the far-famed Duke mine was opened, from which three-quarters of a million pounds worth of gold is said to have been won.

The reefs, some of which were worked in the fifties, were found to be highly auriferous near the surface, and some very rich patches* were found; at Mariner's Reef, 50 to 60 ozs. of gold to the ton is reported: at Blucher's Reef, 2 tons yielded 102 ozs.; and at Flagstaff Reef, 12½ tons yielded 166 ozs. A few aggregate yields, such as Blucher's, 11,679 tons for 8,126 ozs.; Flagstaff, 2,047 tons for 3,866 ozs.; and the Leviathan Reefs (several), 142,729 tons for 65,659 ozs., will indicate that large quantities of payable ore were also mined.

In July, 1862, the Mariner's Reef No. 1 claim, then opening up very rich quartz at a depth of 550 feet, was the deepest mine in the Colony.

The past history of such noted reefs as Mariner's, the Leviathan, Blucher's, Shaw's, the Telegraph, the Flagstaff, Bristol Hill, and others of importance, which will later on be referred to in detail, should encourage the future working of quartz reefs in the district.

The statistics given below, which refer largely to the area dealt with in this Report, bear ample testimony to the great importance of both alluvial and quartz mining in the earlier days.

STATISTICS—MARYBOROUGH MINING DISTRICT.

| Year. | Steam Engines. | | Puddlers. | Whims. | | Whips. | Number of Miners Employed. |
|---|---|---|---|---|---|---|---|
| | Alluvial. | Quartz. | Alluvial. | Alluvial. | Quartz. | Quartz. | Alluvial and Quartz. |
| 1859 .. | 10 | 40 | 707 | 55 | .. | .. | 32,933 † |
| 1867 .. | 38 | 82 | 524 | 105 | 68 | 37 | 9,505 |

The *Victorian Year-Book* shows that when the census was taken in 1901, the population was 5,622 and an estimate made during 1907 showed an increase to 5,906.

During the early part of 1905, dredging companies were formed and machinery was erected to work some of the old shallow leads, such as Blackman's, Main Lead, Inkerman, Schicer Gully, Golden Point, and Moonlight, but all were short lived, this class of mining having so far been unsuccessful around Maryborough, although payable dredging is being carried on only 8 miles away to the south.

For some years cyanide plants have been at work in the district, and all the old tailings of any value have been treated profitably, such as at Mosquito, Blucher's, Mariner's, the Leviathan, &c. In recent years much attention has been given to the treatment of the old slum heaps around the deep alluvial mines from Alma to Timor and at Havelock. Many plants are now at work in the district, and a number of men are employed in this industry.

## III.—THE GEOLOGY OF THE MARYBOROUGH GOLD-FIELD.

The geological formations of the Maryborough Gold-field are the Recent, Post Pliocene, Newer Pliocene, Older Pliocene, and Lower Ordovician. The vast interval of time which elapsed between the Pliocene and the Ordovician periods is not represented by any sedimentary rocks, either here or in the surrounding districts, except by some glacial boulder-clays which occur in the lower part of the Duke Lead and at Carisbrook, where an outcrop may be seen in the creek on Mr. McCrabb's property, allotment 20, parish of Carisbrook. These glacials are probably of Permo-carboniferous age, like those of Bacchus Marsh. Certain dykes and granitic bosses have pierced through the older Ordovician formation. The Ordovician beds were laid down beneath the waters of the ocean, but all the Tertiary deposits are fluviatile or possibly lacustrine in the case of the Post Pliocene.

### RECENT AND POST PLIOCENE.

The Recent deposits form the alluvial flats, and occupy the gullies. They are most extensively developed in the valleys of Four-mile Creek, Chinamen's Flat Creek, Timor Creek, and Bet Bet Creek, where they overlie the Newer Pliocene leads which have yielded a large quantity of gold. They consist of sands, clays, and gravels formed of angular quartz, slate, and sandstone from the adjacent hills, and have accumulated under the conditions now prevailing.

The Post Pliocene formation is extensive along the valley of the Bet Bet Creek, where it overlies the basalt in places. It forms a comparatively level plain, cut through by shallow valleys in which Recent alluvium is found; it is separated from the underlying Newer Pliocene by the basalt. It consists mainly of brown and yellow sandy beds of even grain, and very regular in character, together with yellow clays and fine angular to sub-angular gravels.

Along the Bet Bet Creek good fresh water can be got at the base of this formation by sinking to the basalt at a depth of 30 feet to 50 feet.

* *Maryborough Advertiser.*

† 31,000 of these were alluvial miners, mostly working on the shallower leads.

NEWER VOLCANIC.

The basalt is a lava flow which lies between the Post Pliocene and the Newer Pliocene, along the valley of the Bet Bet Creek. In places there appear to be several flows underlying one another. In the northern portion of the area, the surface of the basalt is only a little above the Bet Bet Creek, and is nearly on a level with the plain formed of the Post Pliocene deposits. Most of the surface is covered with soil, and there are only occasional outcrops of rock where it has best resisted weathering. The flow along the Bet Bet Creek, south of Wareek, forms a well-defined rocky plain.

The boundaries of the area of decomposed basalt have to be defined by its black volcanic soil and the occurrence of pisolitic iron and limestone concretions associated with numerous small mounds which give its surface a typical wave-like appearance. These mounds are most prevalent where there is least drainage, and where the surface waters therefore percolate through cracks and joints in the basalt. This leads to the leaching out and redeposition at the surface of lime, iron, and magnesia from the ferro-magnesian minerals of the basalt. In some places, where basalt has been mapped in, it might be possible to sink a bore or shaft without encountering any solid rock, owing to its total decomposition.

The rock is usually vesicular and amygdaloidal basalt and dolerite, but some of it is fairly dense. It is quarried for road metal to some extent.

Magnesian limestone is associated with the basalt in the northern area, and is derived from its decomposition. At Bartlett's Ford, on the Bet Bet Creek, there is a large outcrop where the basalt flowed over the Ordovician beds. A sample was sent to the Departmental Laboratory, and analyzed by Mr. P. G. W. Bayly (1907, No. 385)—

| | |
|---|---|
| $SiO_2$ .. .. .. .. | 13.4 |
| $Al_2O_3$ .. .. .. | 16.7 |
| $Fe_2O_3$ .. .. .. | Present. |
| CaO .. .. .. .. | 30.6 (=$CaCO_3$ 54.6) |
| MgO .. .. .. .. | 5.2 (= $MgCO_3$ 10.8) |
| $CO_2$, Alkalies, &c. .. .. | 34.1 |
| | 100.0 |

This impure magnesian limestone appears to be a fair sample of such deposits throughout the district

NEWER PLIOCENE.

The great bulk of the Newer Pliocene formation occurs in the valleys of the Four-mile Creek, China men's Flat Creek, Timor Creek, and Bet Bet Creek, where it is hidden beneath Recent aluvial or the basalt; it has been largely worked, and has yielded most of the alluvial gold won in this district. It also forms patchy deposits resting on the lower parts of the spurs along the valleys.

The distinguishing feature of this formation is its red colour, which is due to ferruginous material among the angular and sub-angular pebbles of which it is formed. Some of the wash and gold is derived from the Older Pliocene deposits, which occur as terraces at a higher level. No fossils were found, but Mr. D. J. Mahony, M.Sc., has drawn my attention to the fossil *Phascolomys pliocenus* recorded from auriferous cement at Dunolly, which is considered to show that some of the auriferous gold wash and cement undoubtedly belongs to the Pliocene period.

1. *Four-mile Creek Valley.*—This embraces Blackman's Lead and the Main Lead, which passes through White Hills and Havelock and on to the Bet Bet, where the Duke and Main Leads Company, is now at work. Blackman's Lead is the right-hand head branch of the Main Lead, which it joins at the township of Maryborough.

Blackman's was one of the richest leads worked, and was noted for its coarse gold and large nuggets, one of which weighed 1,034 ozs. and contained about 833 ozs. of pure gold; it was sold in Melbourne for £3 250 in 1855. This lead was accompanied by several small rich tributaries, such as Snake Gully Lead, Spectacle Lead, and Nuggety Lead, and received the runs of gold from Mariner's and Soldier's Hills.

The Main Lead rises south of the township, where it receives several small tributaries from east and west. The shallower portions to the south of the township were not so rich as Blackman's Lead, and below the junction of the two it was poor for over half-a-mile, as far as Commissioner's Flat, which is now called Royal Park. Here the sinking was much deeper, and the gold was distributed over a wider area, the lead being worked for a width of 14 chains. The sinking was through yellow and white clay, with layers of gravel mixed with boulder wash 2 feet to 3 feet in thickness, which rested on a bedrock of slate and sandstone. Yields were obtained of 4 ozs. to 10 ozs. of gold to the load, which consisted of 40 American buckets of wash.

To the north of Commissioner's Flat, the lead turned to the east, approaching the White Hills, and here the run of gold was lost, but after some years it was traced towards Havelock, where it remained unworked for many years on account of bad air and heavy water. After a long interval, the lead, which had been proved further to the north by boring, was worked on an extensive scale by the Main Leads Company and by the Main Leads North Company, both of which paid dividends. At the time of writing, the Duke and Main Leads Consols Company is opening up payable ground near the junction of this lead with the Duke Lead in the Bet Bet Valley.

Numerous tributary leads join the Main Lead from east and west, such as Slaughter Yard Lead, Pinch Gut Lead, and M'Donald Lead from the west, and Griffith's Lead, Clinker Lead, and Happy Jack's Lead from the east.

In tracing this lead on the map (Pl. 1), it will be noticed that it heads in the Western Dyke Belt which it traverses as far as the township; it then crosses the barren Eastern Sandstone Belt (which accounts for its poverty until it reaches Commissioner's Flat); and then traverses the Eastern Dyke Belt and Shaw's Belt at a slight angle, the richest tributary leads coming from the east along these belts.

2. *Chinamen's Flat Creek Valley.*—The lead in this valley was the scene of three rushes before it was systematically worked. It heads in several small branch leads to the north-west of Maryborough, and continues through the Leviathan Reef to Timor, a distance of over 4 miles, before joining the Duke Lead in the Bet Bet Valley. In many places it was mined for a width of several claims, and the wash of heavy quartz boulders is reported to have ranged from 2 feet to 4 feet in thickness. Several small tributary leads join it from east and west, the best coming from the east, such as the Pekin, Black Jack's, O'Brien's, &c.

This lead derives its gold from the reefs of the Western Dyke Belt, to which it is entirely confined from end to end; among the reefs along its course are the Leviathan, the Perseverance, the North German, McCann's, and others.

The first mining machinery erected in the Maryborough District was used in the development of the wet ground in this lead at the Perseverance, Hit or Miss, Magnum Bonum, and other mines at Chinamen's Flat.* Later on, the far-famed Duke mines at Timor were worked by the same means.

3. *Timor Creek Valley* (*Adelaide–Inkerman–Alma Lead*).—The lead in the valley of the Timor Creek heads in the parish of Bung Bong, and passes through the north-western portion of the parish of Amherst before it reaches the area here dealt with. The greater part of its course lies within the Main Indicator Belt. It is called by different names at different parts of its course. The southern part is known as the Adelaide Lead; between Waterloo Flat Lead (a large tributary) and Alma, it is called the Inkerman Lead; thence onwards it is known as the Alma Lead, till it finally joins the Duke Lead near Timor. The two principal tributaries are the Waterloo Flat Lead and the Moonlight–Balaclava–Polish Lead, which joins the Alma Lead at Alma.

This system of leads, like most others, was opened in shallow ground, and was gradually traced onwards. The wash varies from 4 chains to 30 chains in width; it was very wide at the Alma–Moonlight junction.

At Alma, some 24-ft. claims yielded as much as £800 each. The wash, which was from 6 inches to 3 feet thick, carried 1 oz. to 4 ozs. of gold per load, and rested on a bedrock of soft slate and sandstone beneath yellow and white clay and quartz gravel. The sinking at Balaclava was similar. Beyond Alma, the gold was fine and a good deal was lost, which is now being recovered by a number of cyanide plants. Waterloo Lead yielded many nuggets, especially near Inkerman.

4. *Bet Bet Creek Valley.*—The portion of the Bet Bet Valley here dealt with crosses the whole of the parish of Wareek and that portion of Bet Bet adjacent to Timor and Timor West. It flows in a northerly direction from Bung Bong to Wareek, and then turns north-eastward. The leads are here sub-basaltic.

Dunira Creek is a tributary which flows north-west and joins the Bet Bet Creek a little south of the Bung Bong railway station, near the south-west corner of the map, but outside it. The Dunira Creek Lead has been worked along the creek, where it is not covered by basalt, and passes under the basalt on the west side of Bet Bet Creek close to where it enters the area here dealt with; it then probably runs in a northerly direction, since the surface outcrops of Ordovician rocks along the western boundary of the map indicate that it is separated by a ridge from the Madame Hopkins Lead, which lies some distance to the west, and runs in a northerly direction. Some bores near the Wareek State School prove deep ground, possibly a continuation of this lead; in that case, the lead passes into the Bet Bet Valley Lead, which follows the Bet Bet Creek from here onwards and has been successfully worked in places beneath the basalt. The portion of this lead near the junction of Timor Creek with the Bet Bet is known as the Duke Lead. The Grand Duke Company worked here from 1869 to 1896 for a recorded yield of 216,000 ozs. of gold. The ground was exploited from four shafts, the deepest of which was 360 feet. The water was very heavy, and a powerful pumping plant and extensive winding machinery were required.

Between the Black Range and the bridge at Timor West, the deep ground will probably be poor since the lead passes over a metamorphic area in this part of its course, but further east, where the Great Duke bores are shown on the map, the bedrock should be more favorable since it is a continuation of an auriferous belt.

Mr. Stanley Hunter, Engineer for Boring, has fully dealt with the Bet Bet Valley Lead and the Madame Hopkins Lead in his reports on Bet Bet† and Wareek,‡ and details of boring operations will be found in the Diamond Drill Report for 1887, the Annual Report of the Secretary for Mines for 1888, the Monthly Boring Report for September, 1899, and Memoir No. 7, *The Deep Leads of Victoria.*

## OLDER PLIOCENE.

The Older Pliocene deposits consist of well waterworn and rounded quartz boulders cemented by ferruginous material in places; they indicate the trend of the earliest leads of which any record is preserved in the district. Only some scattered remnants have escaped denudation, and all these are auriferous.

## LOWER ORDOVICIAN.

Stratified rocks of Lower Ordovician age cover a large area; they consist of slates, sandstones, and quartzites of various textures and tints, which are described fully on pages 10, 11, 12. These rocks have been thrown into many folds. All the beds conform within a few degrees to the average strike, about N. 15° W. They have been cut through by many faults, and numerous dykes of porphyry and lamprophyre traverse the strata in all directions and at every angle, and some of them evidently occupy fault lines. These dykes have had a direct influence in certain cases on the quartz reefs and their mineral contents (see pages 17, 18, 19).

### 1. The Age of the Strata.

The age of the strata can be determined in one place by graptolites which were found in the Western Indicator Belt on a hill consisting of sandstone, with occasional narrow slate beds close to Bet Bet Creek.

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* E. Wragg, *Reminiscences of Early Maryborough*

† Reports on Rapid Surveys of the Goldfields—Parish of Bet Bet. Spec. Rept., Dept. Mines, Vict., fscp., p. 4, map. 1898.

‡ Report on Wareek. Prog. Rept. Geol. Surv., Vict., No. X, pp. 7–8, map. 1899.

The fossils occur in a hard red ferruginous slate which is barely half-an-inch in thickness, and shows a medial bedding plane on which the white fossil imprints of the graptolites are seen.

Collections made from two outcrops were determined by Dr. T. S. Hall*, as follows :—

"*Collection* 1 (*Nos.* 1811–1872).

"At a bearing of E. 38° S., and 17 chains from the north-west corner of allotment 2, parish of Wareek—

| | |
|---|---|
| *Clonograptus gracilis*, J. Hall .. .. .. | 1812, 1814, 1815, 1826, 1854. |
| *Clonograptus rigidus*, J. Hall .. .. .. | 1829(?), 1847(?), 1855(?). |
| *Clonograptus rigidus*, var. *tenellus*, Linnars. .. | 1813, 1816, 1823, 1858. |
| *Clonograptus* spp. indet. .. .. .. | 1819, 1820(?), 1822(?), 1824, 1832, 1833, 1834, 1841, 1845, 1849, 1853, 1863, 1864, 1867(?), 1868, 1869(?), 1872. |
| *Bryograptus* sp. .. .. .. .. | 1823(?), 1846, 1861(?), 1870(?). |
| *Dichograptus* sp. .. .. .. .. | 1851. |
| *Tetragraptus decipiens*, T. S. Hall. .. .. | 1811, 1817, 1823, 1825, 1828, 1831, 1836, 1837, 1842, 1847, 1850, 1852, 1866. |
| *Leptograptus antiquus*, T. S. Hall. .. .. | 1830(?). |

"The remaining seventeen slabs contain nothing determinate. I think that 1846 is *Bryograptus victoriæ*, but the specimen is not clear enough. Number 1830, doubtfully referred to as *Leptograptus antiquus*, is only a fragment, but I think the reference is correct. The bright brick-red colour of the rocks and their hardness reminds one very strongly of those of Bendigo, but the fossils show them to be Lancefieldian, and, as far as can be judged at present, on the same horizon as those of the type section.

*Collection* 2 (Nos. 2325–2369).

"From allotment 2, parish of Wareek, 3 chains north of locality 1, where the first collection was made—

| | |
|---|---|
| *Bryograptus* sp. .. .. .. .. | 2341, 2348 (counterparts). |
| *Bryograptus victoriæ*, T. S. Hall .. .. | 2353. |
| *Clonograptus* sp. .. .. .. .. | 2328, 2336, 2337, 2341, 2348, 2356, 2357, 2358, 2366, 2368, 2369. |
| *Clonograptus* cf. *magnificus*, Pritchard .. .. | 2333, 2347 (counterparts), and 2353. |
| *Clonograptus* cf. *flexilis*, J. Hall .. .. | 2333, 2365. |
| *Clonograptus* cf. *rigidus*, var. *tenellus*, Linnars .. | 2355. |
| *Tetragraptus decipiens*, T. S. Hall .. .. | 2342, 2343, 2346, 2350, 2352, 2359, 2360(?), 2362, 2363. |

"The remainder are indeterminate.

"The horizon is Lancefieldian. The rocks are bright-red in colour, and very hard. The specimens are poorly preserved, and it is almost impossible to clear them."

The Lancefield zone is the lowest portion of the Lower Ordovician system in Victoria.

The surrounding localities where graptolites have been found, within a radius of 12 miles of the Maryborough Quarter Sheet, area, are—

| | |
|---|---|
| On the north .. .. .. .. | Dunolly and Goldsborough. |
| On the east .. .. .. .. | Moolort. |
| On the south-east .. .. .. | Campbelltown. |
| On the west .. .. .. .. | Wareek (Maryborough Quarter Sheet). |

The above-mentioned localities have so far yielded graptolites of the Lancefield zone, with the exception of Campbelltown and Moolort, where Bendigonian graptolites were found. The Bendigo zone is that portion of the Lower Ordovician which overlies the Lancefield.

## 2. Belts in the Lower Ordovician Rocks.

The Lower Ordovician rocks may be divided into seven belts, which run parallel to the strike; they can be distinguished from one another by the variations in the rocks composing them, and also by the character of the quartz veins and dykes that traverse them. Their main features are set out in tabular form at the end of the series of short descriptions of the various belts. (Plate I.)

In traversing the map from east to west the belts occur in the order given below :—

1. Shaw's Belt.
2. The Eastern Dyke Belt (Blucher's—Amy Castles).
3. The Eastern Sandstone Belt.
4. The Western Dyke Belt (Mariner's—Bristol Hill—Leviathan).
5. The Western Sandstone Belt.
6. The Main Indicator Belt (Waterloo—Inkerman).
7. The Western Indicator Belt (Wareek).

* Rec. Geol. Surv. Vict., Vol. II., Pt. 4. pp. 222.

1. *Shaw's Belt.*—This belt is on the eastern border of the surveyed area and extends from a little east of Blucher's northwards to Havelock. It contains such reefs as Shaw's (from which it is named), the Rob Roy, Harper's, McFarlane's, the Havelock, the Ant, Wilson's, &c., all of which strike west of north, the Ant at a large angle. The reefs are laminated and, though small, are more like fissure veins than those generally met with in the Maryborough District. The yields have on the average been rich, and specimens of coarse gold were of common occurrence. The auriferous quartz generally carried some scattered crystals of iron pyrites, chalcopyrite and galena; in McFarlane's reef antimony ore (stibnite) was found in lenticular patches.

Dykes are absent from this belt.

The Ordovician rocks consist of slates and sandstones. The slates are purple, green, grey, and brown in colour and some of them are pitted, apparently owing to the decomposition of certain minerals. A little blue-black slate with seams and scattered cubes of pyrites also occurs, though it is by no means abundant. The sandstones are grey and brown in colour and medium to coarse in grain. Quartzite is found below water level. A few indicator slates occur, but so far, they have scarcely been prospected.

Rich alluvial gold, both fine and coarse, occasionally nuggety, has been worked in most of the gullies in this belt.

2. *The Eastern Dyke Belt* (Blucher's–Amy Castles).—An extensive belt, which is characterized by the occurrence of auriferous reefs associated with lamprophyre dykes, extends from Blucher's Reef to the Amy Castles Reef, near Keilor's Hill. In it are such well known reefs as the Specimen, the Imperial, the Frederick, Splitter's, the Telegraph, the United Kingdom, and many others of less importance.

The maximum width of this belt is about 60 chains. It consists of slates and sandstones. The slates include pink fissile varieties, pale green to brown slates, blue-black slates, pitted slates of pale green to brown colour, and green micaceous slates. There are also several varieties of sandstone—grey and brown micaceous sandstone, fine grained variegated and banded sandstone, fine to medium grained yellow, white and brown sandstones. On the whole, these rocks are very similar to those in Shaw's Belt.

The lamprophyre dykes are plentiful, and along their walls there are frequently quartz reefs, which probably occupy the spaces left by the shrinking of the dyke when it cooled from the high temperature at which it just became solid to the present temperature. The reefs are found either on the footwall or on the hanging wall, or on both; in one place the reef may be on one side of the dyke and in another place on the other. The dykes all dip to the west and strike, as a rule, to the west of north, except a few which follow fault lines; for example, Ellis's reef strikes N. 44 W., and dips S.W.

The quartz is generally vitreous in appearance and hard to crush. On the whole it has given payable results. The gold is finely divided and is often accompanied by galena and pyrites, especially along the Specimen Reef line. Oxides of manganese and iron, iron carbonate and veins of felspar occur in the reefs and are, very probably, due to the close proximity of the dykes.

A few indicators occur, but very little prospecting has been done along them.

Alluvial gold, both fine and coarse, and some nuggets, are found in every gully crossing this belt.

3. *The Eastern Sandstone Belt.*—The Eastern Sandstone Belt is about 40 chains wide and trends through the rifle butts, east of Royal Park, and onward to the head of Yarrah Gully.

The Ordovician strata in this belt differ considerably from those in the belts to the east and west. Sandstone is the predominant rock and is generally medium to coarse grained in texture, and yellow in colour; there is also some green, medium-grained sandstone. The slate occurs as thin beds of green colour, very seldom pitted and generally poor in distinguishable minerals. These beds are folded into sharp anticlines and synclines. The dip of the strata at each side of the fold exposed at the head of Iredale's Gully is 80°.

This belt is almost destitute of auriferous quartz.

Only one or two lamprophyre dykes, such as the Native Youth and the Engine Shops dykes, occur in the belt, and these follow fault lines running nearly east and west and dip southwards. A large porphyry dyke forms the boundary between this belt and the next belt to the west. At the northern end of the belt there are several porphyry dykes and one or two lines of indicators. Some of the gullies crossing the southern end of the belt carry alluvial gold, but those to the north are very barren.

4. *The Western Dyke Belt* (Mariner's–Bristol Hill).—This is the central belt of the district. It is well over a mile in width and passes through Mariner's and Bristol Hill and along Chinamen's Flat, and includes such well-known reefs as Ellery and Passmore's, Pound Hill, the Leviathan, and all those occurring along the Chinamen's Flat valley. The richer and more consistent reefs occur in the western half of the belt.

The strata are slate and sandstones, something like those of the Eastern Dyke Belt, but in this belt the folding reaches a maximum. None of the reefs follow the bedding over the arches like the saddle reefs of Bendigo, except one small vein exposed in the Avoca railway cutting. The slates include purple, yellow and brown pitted varieties: pitted green slates containing big cubes of pyrites; red pitted slate; fissile green slate, and purple and yellow variegated and banded slates. The pitting is a common feature and is, no doubt, due to the leaching out of secondary minerals and alteration products. The sandstones are coarser on the eastern side than on the western side of the belt. In the case of some of the very fine grained varieties, it is difficult to distinguish them from slates. The fine varieties are yellow and pink and the medium-grained are white with occasional cubes of pyrites.

Lamprophyre dykes, parallel to the strike of the beds, are numerous and are the distinguishing feature of the belt, and a peculiar feature not noticed elsewhere is that they send off horizontal tabular offshoots like sills but cutting across the steeply inclined beds. In all observed cases these offshoots branched off in an easterly direction from the dykes.

Unlike the reefs in the Eastern Dyke Belt, the quartz reefs in this area are generally a little removed from the dykes, although they run parallel to them and are evidently connected with them genetically. The horizontal offshoots from the dykes cut the reefs, and where this occurs, an enrichment in the gold contents, together with the presence of felspar crystals, can be noticed in the reef above the dyke rock. Galena, chalcopyrite, stibnite, psilomelane, &c., occur in the quartz reefs, and talc, felspar and chlorite in the rocks accompanying the dykes.

Rich gold yields have been won from the quartz right along the belt, and some very rich patches are recorded.

Alluvial gold has been worked in the gullies as far north as Timor. The gullies have been more consistently good on the south than on the north; they contained coarse gold with occasional nuggets.

5. *The Western Sandstone Belt.*—This belt passes through the 1-mile post on the Avoca railway line, Harris's slaughteryard, Hobson's, and to the west of the Timor cemetery. Its maximum width is about 70 chains. It is distinguished by predominating sandstones and the absence of lamprophyre dykes.

A large porphyry dyke and a triple intrusion of some basic dyke rock occur near the centre of the belt. The beds here are indurated in some degree, and felspar veins are developed.

The sandstones are medium to coarse grained in texture and yellow and grey in colour. Grey micaceous sandstones and green sandstones of medium grain also occur. Green and grey slates occur in thin beds, and then only occasionally. There is a line of pitted slates near the centre of the belt. Any folds that are exposed are sharp. In the railway cutting near the big porphyry dyke, the beds are much crumpled with minor folds. A few indicators were noticed along this belt, but they have not been prospected since there is no sign of their being auriferous in the shape of alluvial gold in the gullies which cross them.

There are some large outcrops of quartz in this belt but they are barren. Welshman's is the only reef worked; it is a small reef resembling those in the Eastern Sandstone Belt.

This belt is almost destitute of auriferous quartz and the alluvial in the gullies has been remarkably poor. The leads which do carry gold have their origin in the Western Dyke Belt, and have probably derived their gold contents from it.

6. *The Main Indicator Belt.* (Waterloo–Inkerman).—This belt, which is 2 miles wide, extends from between Moonlight and Waterloo through Alma to the Bet Bet Creek. It is distinguished by the occurrence of numerous "indicators" and its paucity in dykes. The indicators are confined to a certain series of beds, the principal being to the east of Waterloo. The indicators of Maryborough are certain pitted slate beds, pale to dark green or purple in colour, which always carry a laminated vein of metasomatic quartz and which also contain in parts iron pyrites, either in the slate itself or in the laminated quartz vein (see page 14).

The strata are slates and sandstones. The slates form rather thin beds, but are plentiful in the neighbourhood of the main indicator lines. They are green, brown, or red in colour and generally pitted, but some are plain fissile slates. Those of a purple or green colour seem to be most favorable for the occurrence of gold. The sandstones are fine grained and grey to brown in colour, but medium grained, yellow and brown ferruginous sandstones also occur. Much oxide of iron (limonite) occurs as veins and splashes throughout these beds at and near the surface. The folding is not so sharp as in some of the other belts and is exposed in the Alma–Wareek road cutting, where an indicator can be seen following an anticline (Fig. 4). Northwards, the character of the rocks changes and the indicators disappear; this is apparently due to the northerly pitch of the folds.

Dykes are very rare. One running east and west cuts across an indicator on Slaughter Yard Hill, Alma, and a small granite boss has been exposed by dredging operations at Inkerman.

In this belt the gold has mostly been found associated with the intersection of the indicators and thin quartz veins which are more or less nearly horizontal. Some of the indicator lines have been rich, and details of them will be found on pages 65 and 66. There are a few lines of quartz reefs, but they are, as a rule, barren. The only one which has given profitable results is Trompf's Reef, which lies outside the area surveyed.

Almost every gully crossing the belt as far north as Alma and Slaughter Yard Hill has been worked for alluvial gold, but further north all are remarkably barren, with the exception of Coate's Gully. This change corresponds to the different appearance of the rocks and the disappearance of the indicators.

7. *The Western Indicator Belt,* Wareek.—This belt includes most of the Wareek State Forest. It is very poor in gold.

The strata consist of slates and sandstones; the slate in narrow beds, green and brown in colour and very little pitted; the sandstones medium to fine in grain, yellow and brown in colour, with many veins and patches of limonite. The sandstone predominates. These beds are thrown into a series of folds which are large and regular. There are a few indicator lines. Graptolites characteristic of the Lancefield zone of the Lower Ordovician system were found in the western part of this belt.

Only one lamprophyre dyke was seen; it lies to the east of the Wareek Rush.

There are some large barren quartz outcrops, but no reef is worked. Much ironstone occurs in the veins. The indicators are unprospected. Nearly all the alluvial is barren, except at the Wareek Rush and at Steed's Gully.

## Tabulated Description of the Belts of Lower Ordovician Rocks at Maryborough. (Plate I.)

| Belt. | Dykes. | Reefs. | Indicators. | Slates. | Sandstones. | Remarks. |
|---|---|---|---|---|---|---|
| 1. Shaw's Belt .. | Absent .. .. .. | Laminated quartz reefs, generally narrow, but resemble fissure reefs | Few .. .. .. | Purple and green slate; grey and brown, pitted; blue-black with pyrites in seams and scattered cubes | Grey, fine grained: brown, medium; a little coarse grey; quartzite below water level | Antimony ore in some of the reefs. |
| 2. The Eastern Dyke Belt (Blucher's–Amy Castles) | Lamprophyre dykes very frequent; generally run about north and south and dip west | Reefs laminated, blocky; generally formed in fissures along the walls of the dykes | Few .. .. .. | Pink, fissile slate; pale-green to brown: green and brown pitted; grey micaceous: blue-black | Grey and brown micaceous sandstone; variegated and banded, fine grained; yellow, white and brown fine to medium in grain | Minerals in the reefs probably due to influence of dykes — manganese oxide, iron oxide, carbonate of iron, felspars. |
| 3. The Eastern Sandstone Belt | Dykes rare. A large porphyry dyke forms the boundary of this belt; two porphyry dykes between Timor and Havelock; two lamprophyre dykes in E. and W. fault lines | Reefs scarce; only a few worked, Eldorado, &c. Small fissure reefs in hard country | Few .. .. .. | Narrow beds of green slate, poor in minerals; very seldom pitted | Predominant medium to coarse grained yellow sandstone; grey, micaceous; green, medium grained | Folds sharp; the anticline at the head of Iredale's Gully dips 80° each way. |
| 4. The Western Dyke Belt (Mariner's–Bristol Hill) | Dykes rather frequent. Main porphyry dyke at Bristol Hill; lamprophyres along main N. and S. lines; vertical to westerly with horizontal off-shoots | Some fissure reefs (laminated); but generally large formations of quartz with spurs. Apparently enriched when cut by horizontal dyke | More frequent; the cross veins dip at a high angle and have so far proved poor | Slates wider; frequent beds; much pitted. Purple, yellow and brown pitted slates; green, pitted, with large cubes of pyrites; red, pitted; fissile, green; purple, yellow, and variegated | Fine grained, yellow and pink medium grained banded yellow and white, with some cubes of pyrites. Coarser on E. side. Some of the finer sandstones very like slates | Folding frequent, much more so than in the other belts. The reefs cut the folds irregularly; only one small reef observed to follow a syncline (Avoca cutting). Felspar, talc, chalybite found in the reefs near the dykes. |
| 5. The Western Sandstone Belt | Lamprophyre dykes absent. One large quartz porphyry dyke runs N. and S. through the middle of the belt and close by is a triple dyke (basic) | Some large barren quartz outcrops; only one or two prospected. Only one reef (Welshman's) worked; a small reef similar to those in the Eastern Sandstone Belt | Scarce and unprospected; gullies poor in alluvial gold | Rare and then only as thin beds. Green and grey. A line of pitted slates near middle of belt | Predominant sandstones medium to coarse grained, yellow and grey. Micaceous sandstone; green, medium grained | Folds sharp. The beds are much crumpled near the dykes in the railway cutting. |
| 6. The Main Indicator Belt (Waterloo–Inkerman) | Dykes rare. One runs E. and W. across the indicators at Slaughter Yard Hill, Alma. A granitic boss was exposed by dredging operations at Inkerman | A few reefs; the only important one is Trompf's at Waterloo (outside surveyed area). On W. side of this belt is the Crown and Kettle Reef | Indicator lines frequent; worked at Waterloo, Inkerman, Alma, Rowle's Gully and Balaclava South on the E. side of Moonlight lead | Narrow beds of frequent occurrence along the main indicator lines. Green, red, and brown pitted slates; some grey fissile slates. The purple and green slates are most favorable for gold | Fine grained, grey to brown; medium yellow and brown (ferruginous) sandstones | Folds generally less sharp. Indicator slates exposed following the folds in the Alma-Wareek road cutting. Oxide of iron occurs as veins and splashes throughout the belt. |
| 7. The Western Indicator Belt (Wareek) | Only one lamprophyre dyke (E. of Wareek Rush) | Some large barren quartz outcrops. No reef opened. Nearly all alluvial gullies barren | A few lines; none prospected. A main line runs through the prospector's claim at Wareek alluvial Rush | Some thin beds of slate, but very little pitted slate. Mostly green and brown | Medium and fine grained, yellow and brown. Many ferruginous veins and patches | Folding very general and regular. This belt is very barren, although much ironstone and quartz occur along the hills. |

### 3. Folding.

The opportunities for examining the folding of the Ordovician strata are very limited, the exposures being confined to the few outcrops on the soil-clad hills and spurs, a few accessible mine workings, and the railway cuttings. The average strike of the axes of the folds is about N. 15° W.

The main folding occurs in the Western Dyke Belt, and there may be some connexion between the folding and the intrusion of the dykes. The large porphyry dykes occur on or near anticlinal folds.

In the other belts the folds occur at wider intervals, but near the 5½-mile post on the Avoca line some sharp minor folds are seen. Sharp folds were also sectioned at Mariner's railway cutting, in the quarry at the head of Iredale's Gully, and in the Western Sandstone Belt at the 1½-mile post on the Avoca line. In the latter locality, the beds in a main anticline are much contorted and faulted, and are traversed by several dykes.

In the parish of Wareek, slate beds with laminated quartz veins follow the folds; the quartz veins are formed along planes of movement parallel to the bedding, and are somewhat saddle-like. (Figures 4 and 5.) With the exception of these veins, and one or two very small quartz veins which follow the folds for a few feet, there is nothing approaching a saddle reef. One of the small occurrences just mentioned is 1¼ miles from Maryborough on the Avoca line, and the other is on the Portuguese line of reef above the rifle butts. The reef formations noted throughout the survey nearly all cut across the strata.

From a careful examination of the railway cuttings on the Avoca line, a general section of the folding across the Quarter Sheet was obtained; there are a number of synclinal and anticlinal folds, besides some minor corrugations. (Plate II.)

The pitch where noted was 15° to 20° northward. Owing to this, the more auriferous strata of Maryborough disappear beneath a less auriferous series as they are followed in a northerly direction. This appears to be the explanation of the poorness of the northern continuation of the auriferous belts. For instance, the Main Indicator Belt on the south was very rich, and alluvial gold was worked in nearly every gully crossing it; whilst, after crossing Moonlight Lead the beds are nearly barren, and alluvial gold has been found only in one small gully at Coates' Lead. (Plate I.)

This feature is repeated in nearly every belt, and it occurs further south in the western belts than in the eastern or Maryborough belts.

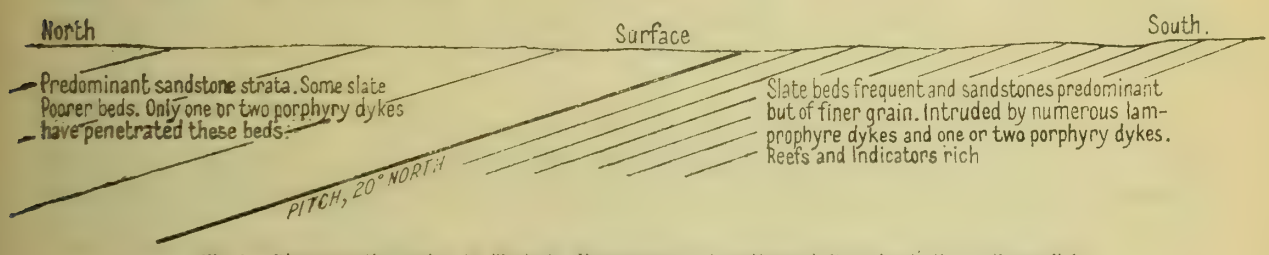



Fig. 1. Diagrammatic section to illustrate disappearance of auriferous belts owing to the northern pitch.

### 4. Cleavage and Joints.

The cleavage planes observed in the slate beds in some places nearly coincide with the bedding, but at others make wide angles with it according to the proximity of the folds. They usually dip with the strata and strike in the direction of the axes of the folds.

In several of the indicator slate beds the cleavage is well developed and distinct, sometimes making a considerable angle with the bedding planes, and parallel to the latter the laminated quartz veins have formed. Where the slate cleavage is well developed the search for fossils is rendered difficult, the slates often breaking more readily along the cleavage than along the bedding.

In the sandstone beds jointing occurs more or less at right angles to the bedding planes. Good examples are to be seen in the cutting 1½ miles west of Maryborough on the Avoca railway line. Radial jointing and fissuring on a smaller scale occur in the minor folds on the north side of the western end of the same cutting.

A characteristic prismatic jointing which gives rise to clean-cut faces occurs in many of the dyke rocks, especially in the narrower intrusions. It is due to the contraction of the dyke rocks on cooling. The rock fractures symmetrically, and the forms of the resulting fragments serve to distinguish decomposed dyke rocks which are parallel to the bedding from certain sandstones, which are very similar to them in general appearance.

### 5. Faults.

#### (*a*) *Cross-courses* (*dip faults*).

The Ordovician rocks and the quartz veins which they contain are traversed by many minor faults. This can be seen in the old mines and the railway cuttings.

The larger faults, which are generally cross-courses (dip faults) and which all hade south, are most prevalent in the dyke belts and are at times made conspicuous at the surface where a dyke has filled the fault to a width of several feet. These faults run in an east and west direction.

The apparent movement of the beds on the northern side of the faults relative to the beds on the south side is westward, but the reverse occurs in some strong faults, such as that at Bristol Hill, where the largest fault has displaced the porphyry dyke over 60 feet. (Plate III.)

In the Eastern Dyke Belt a fault line strikes W.22°N. across the beds, traversing the belt from side to side, but failing to penetrate the Eastern Sandstone Belt. This fault is in places occupied by a lamprophyre dyke and some quartz. At its south end is Ellis's Reef and at its north-west end is the Elizabeth Reef. The fault has been invaded by the dyke and widened out here and there, and in places quartz has been deposited along its walls.

Another somewhat similar fault, striking on the average E.15°N., carries the Marionette Reef and a lamprophyre dyke. Splitter's Reef was cut off at its northern end by this fault, and the Telegraph Reef was cut off at its south end, the movement apparently being to the east.

In Clinker Lead, a little to the north of the Telegraph Reef, another similar fault, striking nearly east and west is defined by the infilling dyke rock, and from the plan it appears that the movement has been to the west, the New Telegraph and the United Kingdom Reefs having once been on the same line.

The Native Youth line of dyke, which is 15 feet thick, has been intruded along an E.W. fault. It lies to the east of the township, and can be picked up again on Bristol Hill on the other side of the town, where its width and other characteristics are the same. At Bristol Hill the apparent relative movement of the beds on the northern side of the fault is about 30 feet to the west; this can be determined by the displacement of the main porphyry dyke to that extent. It is also noticeable that this fault practically traverses the Western Dyke Belt. (See Plate III.)

Other similar, though small faults, can be seen at Slaughter Yard Hill, Alma, and Victoria Reef, south of the Leviathan mine. All the cross-course faults dip south.

In the Main Indicator Belt which passes through Alma Lead and Alma to the west of Maryborough, there are small faults in which the apparent movement of the northern side is generally to the west, such as the fault on Swain's Indicator, in which the horizontal movement was 16 feet, and the series of small faults a little further north in the Inkerman Dredge paddock; the latter have been caused by an intrusive granitic boss, which has had an upward movement and also a side movement to the west.

### (*b*) *Slides* (*strike faults*).

Slides or strike faults, running more or less in the direction of the strike of the beds, are seen in the cuttings and surface workings, but none of any extent came under my notice, although strong faults of this class are recorded in the workings at Shaw's Reef and the Leviathan Reef. At Blucher's Reef there appears to have been one which caused the reef to be cut sooner than expected in the 550 feet level. Shaw's slide came in from west to east and moved the reef only a few feet; it was cut in the bottom of the Extended shaft, and again just below the 400 ft. level in the main shaft.

## 6. Indicators.

Throughout the Maryborough–Wareek district indicator lines occur, but they are generally separated by wide intervals. In the western portion of the surveyed area they are more frequent and have received most attention.

In the belt between Waterloo and Moonlight, indicator lines in adjacent parallel beds are the main feature. This belt is referred to as the Main Indicator Belt.

In this belt there are three series of strata carrying indicator beds, which have shed coarse alluvial gold and nuggets on both sides until they are carried below the surface by the prevailing northern pitch of the folds.

The indicators in this district are certain slate beds, within which seams of metasomatic quartz and pyrites have been formed. (Fig. 2.) They are not themselves auriferous, but appear to have caused the deposition of gold in the quartz veins that cross them.

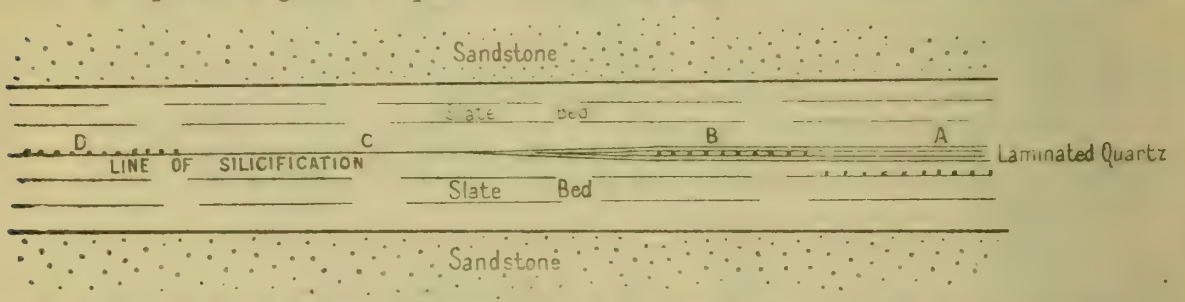



Fig. 2. Diagram to illustrate the occurrence of metasomatic quartz and pyrites in indicator slates. (A) Quartz and pyrites occurring apart; (B) Occurring together; (C) Thread-like quartz vein; (D) Similar to (C), but with pyrites developed.

The slate is mostly pale to dark-green or purple in colour, and, without exception, is more or less pitted. The pitting is due to the leaching out of some secondary mineral, which is frequently pyrites, as is evidenced by the cubical shape of the cavities and by the iron oxide stains which surround them. Below water level this pitting would, of course, be absent, since the secondary mineral would be undecomposed there.

The pyrites generally occurs in shoot-like form, sometimes concentrated into a compact seam, and at other times scattered and disconnected; but in all cases it is favorable to the deposition of gold at its junction with the veins which cross the indicator.

A well developed secondary mineral in the indicator beds of the Maryborough district is the laminated metasomatic quartz, which is found as veins in all these beds, but is more highly developed in some than in others. The veins are well defined, and consist of laminated saccharoidal quartz with partings of crushed slate, which sometimes appears only as a green slickensided face, but often shows as distinct slate.

The slickensides indicate that movement has taken place in two distinct directions. The vertical striations are due to east and west movements in the direction of the dip of the strata, and the nearly

horizontal striations are due to north or south movements in the direction of the pitch of the folds These movement planes were probably formed at or about the time of folding, and perhaps represent very slight displacements. Silica has been able to penetrate along them and to form the laminations of quartz by metasomatic replacement of the slate. These veins may occur in different positions in the slate bed, but they are always parallel to the bedding.

The veins may consist of a single lamination or many parallel laminations, and they range up to 6 inches or more in width. Fig. 2 shows how the secondary minerals may vary at intervals along the same indicator bed.

The practical value of these veins is that they are easily traced and form a sure guide in following the indicators. Only when pyrites is found amongst the laminations does the gold occur opposite the quartz vein. Besides the fully developed metasomatic quartz veins there are often white lines merging into a quartz laminations, showing the silicification to be incomplete. If developed in width, this gives the bed the appearance of a banded green and white arenaceous slate.

The cross veins in which the gold occurs may be thin floors or fissures, gritty quartz and iron oxide veins, or semi-vitreous quartz veins several inches in width. All these variations may be found in most veins, and this has been the cause of indicators being abandoned and of the floors being again picked up by other parties when the quartz has made. A typical section is given to illustrate the changes along one of these veins. (Fig. 3.)

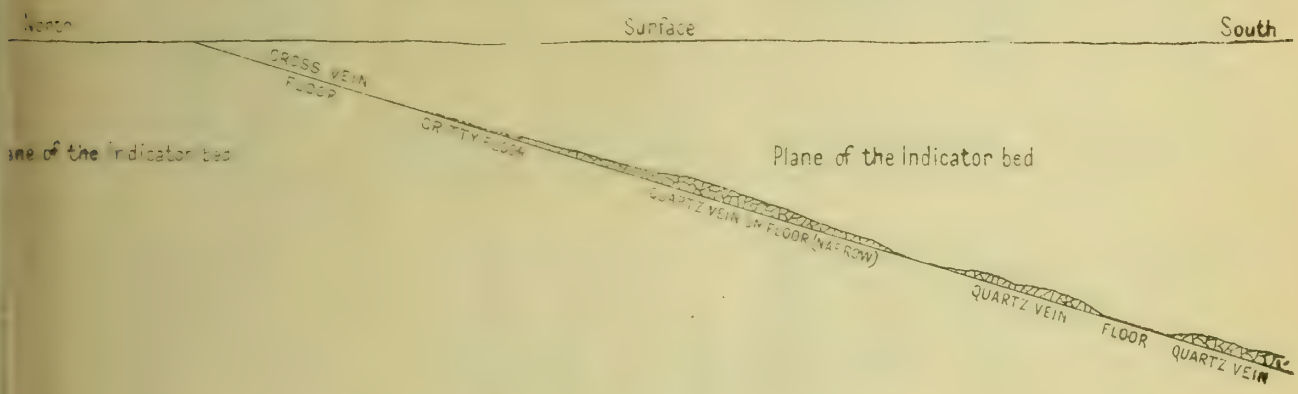



Fig. 3. Diagram to show variations in thickness of a cross vein cutting the indicator. Longitudinal section.

In the Maryborough–Wareek district the cross veins all dip south, those in the Eastern Series being more nearly horizontal than the others. The smaller the dip of the cross veins the better they are, since they give a greater length for mining before water level is reached. Moreover, with the flatter veins, one claim has the opportunity of working several, one below the other, before reaching water level.

Gold never occurs in the indicators; it always occurs in the cross vein.

In some cases the gold shoot is at the junction of the cross vein with the laminated quartz vein in the indicator, but this happens only when secondary pyrites is disseminated in the laminated vein, as at Inkerman and Alma. In other cases, as at Waterloo, the rich gold shoot is just to one side of the laminated quartz vein, and opposite a decomposed pyritic seam. The pyrites may occur as a compact seam or as a line of scattered crystals parallel to a bedding plane. In every case noted of enrichment along the indicator, pyrites was present under one or the other of these conditions.

As usual with Ordovician sedimentary beds, the pyrites is never continuous throughout an individual bed, but occurs in a shoot-like form, so that at one point it may be abundant, a few chains away less plentiful, and then absent.

In the cross floors and veins cutting the indicator, there are two varieties of gold—

(1) Round shotty gold generally partly coated with oxide of iron, and in some cases resembling water-worn gold. In some alluvial leads what appears to be water-worn gold is only the round and shotty indicator gold which has not travelled or been water worn. This class of gold is found to occur in the narrower portions of the cross fissures associated with oxide of iron.

(2) Very clean gold, free from iron oxide, rugged in form, and not so solid, is found where the cross vein is larger and composed of clean quartz, the iron oxide, if any, being on the walls and separated from the gold which is situated in the middle of the clean quartz.

The above will account for the two classes of gold found in small alluvial gutters which head from indicator lines; the two varieties of gold are generally considered to have different origins. The value of indicator gold is uniformly over £4 per ounce. So far, in the cases noted in the Maryborough district, no galena or chalcopyrite has been recorded in the indicators or in the cross fissures; whereas in the other reefs these two sulphides are of fairly common occurrence. This may have a bearing on the high value of the indicator gold.

### *The Influence of Folding on Indicators.*

None of the actual workings in the district show a cross fissure cutting the same indicator twice on a folded bed; yet at Waterloo, just north of Smart's indicator, which dips to the west, there is a line of indicator dipping east on which an auriferous cross fissure has also been mined. This eastern dipping line is a continuation of Smart's western dipping lines on the other side of the fold.

Two exposures in cuttings which were sectioned during the survey, expose pitted slates with pyrites and the usual laminated saccharoidal quartz vein folded into a syncline and an anticline respectively. The anticline is in a road cutting to the west of Alma (Fig. 4), and the syncline in the Avoca-Maryborough railway cutting near the 5½-mile post (Fig. 5).

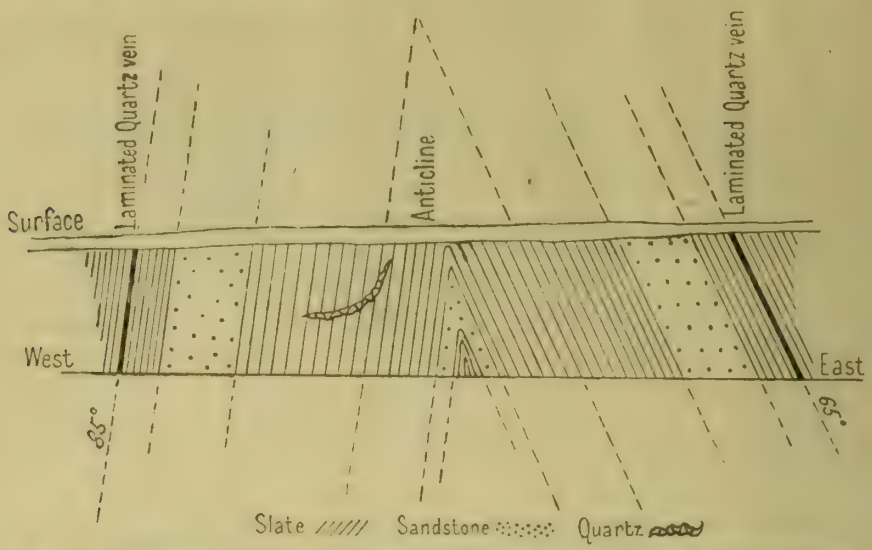



Fig. 4. Road cutting west of Alma, showing indicator following an anticline. Scale 10 feet to 1 inch

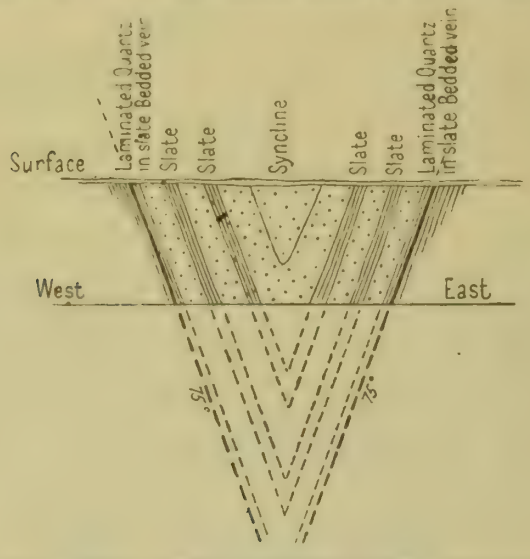



Fig. 5. Indicator following syncline. Maryborough railway cutting near 5½ mile post.

When there are parallel indicators, one of which has been proved a favorable line, then by carefully watching the folding of the strata the individual lines may be located again to the east or to the west. For example, if two indicator lines, A favorable, and B unfavorable, interfold with two anticlines and a syncline, in the following ideal section we would expect four outcrops of A and two of B.

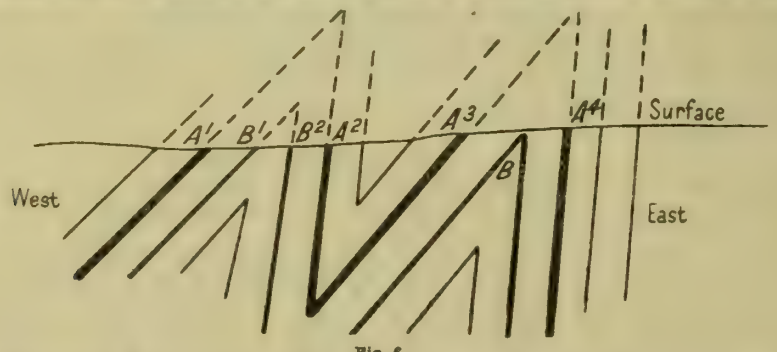



Fig. 6.

The most favorable position for a cross fissure would be at the apex of a fold and coincident with the pitch, for here a larger payable area of cross vein would occur on the indicator.

## 7. Dykes.

Dykes in the Maryborough District are of much importance, for most of the gold-bearing quartz reefs have been found associated with dykes intrusive into the Lower Ordovician beds.

There are different classes of dykes in the area under notice; of these, the quartz porphyries were the first intruded; then the lamprophyres, striking more or less nearly north and south; and, finally, other amprophyres which found an easy passage along some of the larger fault lines trending east and west.

In addition to the ordinary dykes there are two small bosses of igneous rocks. One, situated at the Inkerman dredge paddock, is apparently a granite composed of quartz, felspar, and biotite. The other is at Donkey Gully, east of Maryborough, and is a fairly coarse-grained rock with predominant hornblende and is apparently distinct in composition from the other rocks of the district. Both these occurrences were too decomposed for microscopical examination.

*Quartz Porphyries.*—A dyke of quartz porphyry (Fig. 17), 20 feet in width, outcrops near the old reservoir, and can be easily traced up to and over Bristol Hill and as far as the Pekin-road Hill on the north. This dyke is faulted and cut by a porphyrite dyke of later origin. (Plate III.)

Another dyke of porphyry, 22 feet in width, and lying to the west of Bristol Hill, traverses the Avoca railway cutting, and can be traced as far north as Harris' slaughter-yard.

A third intrusion of this class, nearly 40 feet in width, can be traced from the cemetery through the Carisbrook road-cutting, and along Griffith's Gully as far north as Warton's paddock.

A fourth and smaller porphyry dyke, 6 feet wide, outcrops a little to the north-east of Coleman's Reef, Donkey Gully.

These dykes vary from a hard pale-yellow to a very soft white rock (kaolinized felspar), suitable for pottery manufacture. (See p. 67).

The quartz porphyry dykes have apparently no bearing on the deposition of the gold or the position of the payable quartz reefs, as only in one case, Bristol Hill, is gold-bearing quartz worked along a line of quartz porphyry. The other three dykes are absolutely barren along their course, the two outside ones being in the poorest belts of country. Moreover, where the Bristol Hill dyke has been worked, we have the influence of the lamprophyres in the Western Dyke Belt.

*Lamprophyres.*—The lamprophyre dykes are of great importance in Maryborough, and form most valuable guides to those interested in quartz mining in this district.

In both the belts of country where there are important reefs, these dykes are numerous and appear to have a distinct connexion with the occurrence of the gold. These belts have already been referred to as—

(*a*) The Eastern Dyke Belt.

(*b*) The Western Dyke Belt.

(*a*) In the Eastern Dyke Belt the auriferous quartz is largely dependent on the occurrences of lamprophyre dykes, which vary in width from a few feet up to 10 feet or more. They run more or less north and south, and all dip to the west at angles varying from about 45° to 70°. Besides these, there are a few which lie along fault lines striking in an easterly and westerly direction (Figs. 7 and 18). In all cases the payable quartz reefs associated with dykes of this class in the Eastern Belt have been of a blocky character, formed in the fissures left by the contraction of the dyke whilst cooling, and therefore always having at least one wall of dyke rock.

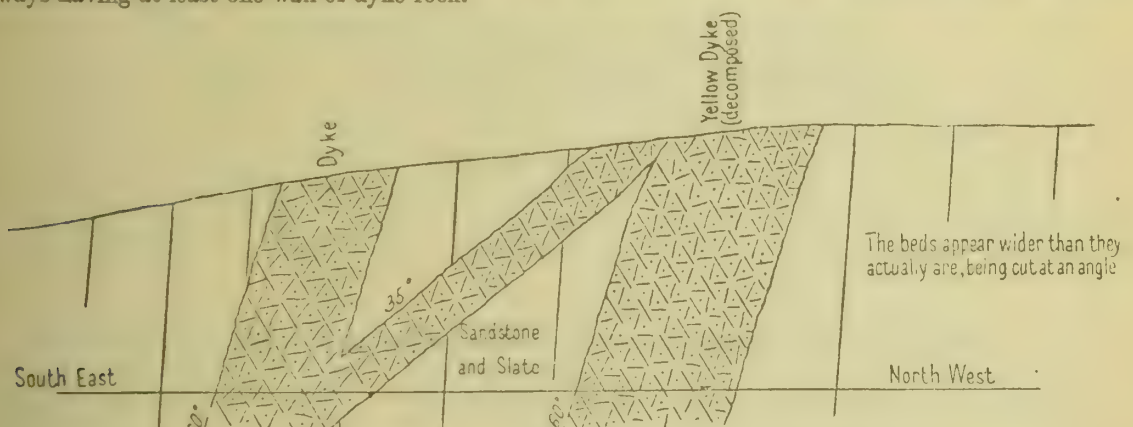



Fig. 7. Dykes near Locomotive Engine Shops, Maryborough. Scale 10 feet to an inch.

The quartz blocks are formed sometimes on the foot-wall, and sometimes on the hanging wall of the dyke (Figs. 8, 9), so that, when one block has been worked out, there is always a possibility of another being found on the opposite side of the dyke adjacent to or below the quartz last worked. In several of the reefs in the Eastern Belt, the blocks have been found on both walls, as in one case where the dyke was known as the "red ground." In Splitter's Reef, which occurs on the foot-wall of a dyke, there were three distinct blocks which each carried gold to a different extent, and which were separated by blanks along the wall of the dyke. The Telegraph Reef consists of two veins, one on each side of the dyke, and both were profitably worked.

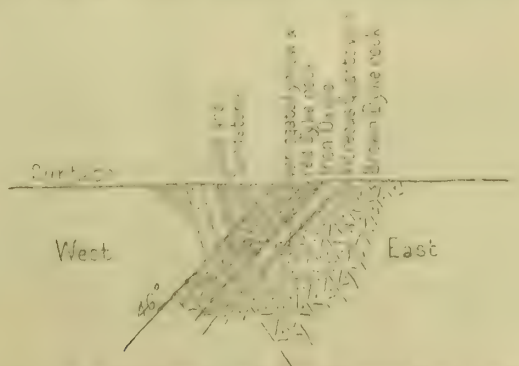



Fig. 8. Quartz reef in dyke rock near the hanging wall, New Telegraph Reef. Scale 10 feet 1 inch.

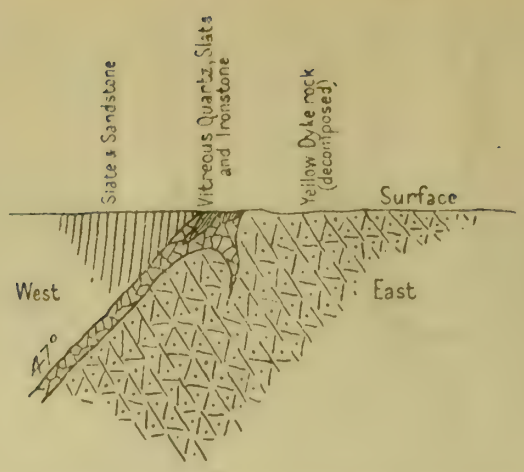



Fig. 9. Quartz reef on hanging wall of dyke, head of Dead Horse Gully. Scale 10 feet to 1 inch.

(*b*) The Western Dyke Belt includes the country running northwards through Mariner's and Soldier's Hill, Bristol Hill, and Chinamen's Flat on the north. It is separated from the Eastern Dyke Belt by the almost barren Eastern Sandstone Belt.

In this belt the reefs consist for the most part of a large series of quartz spurs and extensive veins, which occur in a defined channel. The main dykes occur a little to one side of the reef channel, and not directly in contact with the reefs as in the Eastern Dyke Belt.

At varying depths the main dykes, which are nearly vertical, send out horizontal offshoots (Fig. 10), which cut the reef channels and strata, and extend in some places for a considerable distance ; at Pound Hill and Bell's Gully, one can be traced for about half-a-mile (Figs. 11 and 24).

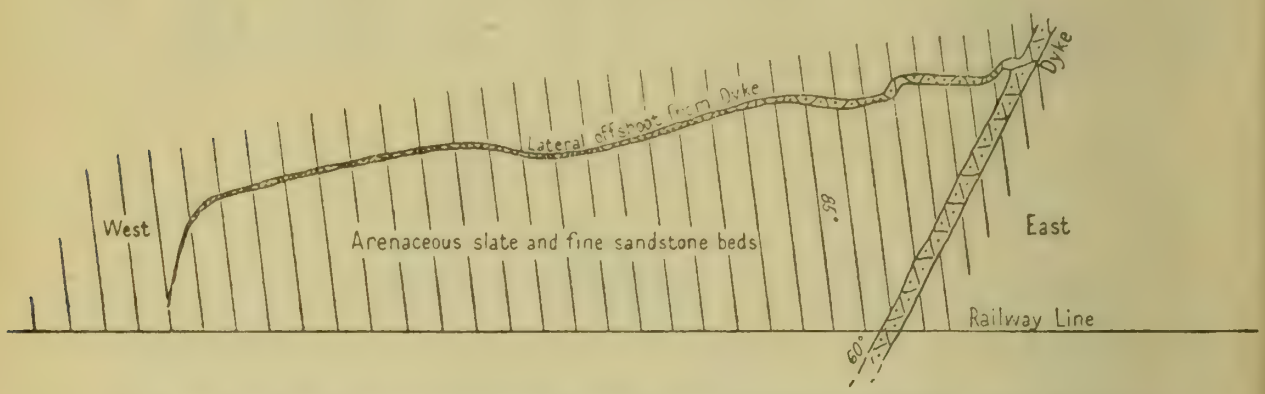



Fig. 10. Lamprophyre dyke, with complete lateral offshoot ; railway cutting, 1 mile east of Maryborough. Scale, 4 feet to 1 inch.

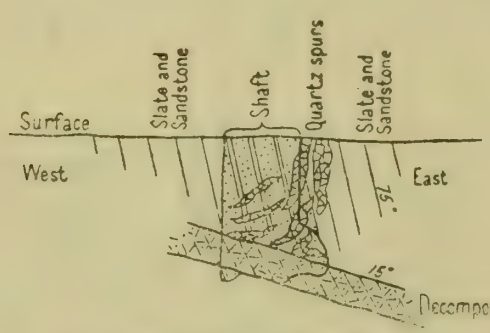



Fig. 11. Dyke offshoot crossing quartz and strata, Bell's Gully Reef. Scale 10 feet to 1 inch.

When these lateral offshoots cut through a reef or reef channel, they appear to exercise a direct influence on the gold contents of the quartz above them. They frequently occur near the surface, and have been examined at a depth in the Leviathan Mine (460-ft. and 700-ft. levels), and at Mariner's Reef (528-ft. level). The knowledge of their occurrence at a depth should be useful in the case of some of the old reefs and channels, which have only been worked above the first and second lateral offshoots of a dyke.

Generally speaking, these lateral offshoots vary from a few inches up to 4 feet in thickness, and are often nearly horizontal ; but occasionally they have a pitch to the east and south. When low-grade shoots pitching north are being worked, and one of these dykes is met with, great care is needful to avoid losing the shoot through following an enrichment pitching south along the intersection of the reef and the dyke.

In this Western Belt there are also a few dykes running E. and W. along fault lines dipping to the south.

The lamprophyre dyke rocks in both the above belts are fairly uniform in general appearance below water-level, but above that level in the oxidized zone they undergo great alteration and assume various colours. Specimens of the weathered rocks differ greatly among themselves; this causes much difficulty in recognising and tracing the dykes at the surface, especially where they resemble the surrounding sandstone beds and nearly conform with them. In colour, surface specimens are white, yellow, brown, red, or purple, according to the amount of oxide of iron present. Quartz reefs with red or purple dyke rock on their walls are said to give the best average yields. The iron oxide pigment is best preserved in dykes cutting through slate beds which are sufficiently impervious to prevent the leaching out of the iron oxide arising from the decomposition of the ferro-magnesian minerals. The other colours, white and pale yellow, occur when the dyke traverses sandstone beds which are sufficiently pervious to absorb the leached-out iron oxide from the dyke.

In tracing these lamprophyre dykes through slate country, a strong cap of ironstone in smooth concretionary and nodular form is often found; the cross dyke near Alma may be cited as an example. (Plate VII.) This dyke has a strong outcrop of iron oxide over 3 feet in width, a sample of which from Slaughter Yard Hill was assayed at the Departmental Laboratory (No. 609/07):—

| | | |
|---|---|---|
| Gold .. .. .. | Nil | Per ton of sample. |
| Silver .. .. .. | Nil | |
| Iron .. .. .. | 52.21 per cent. | |

Besides iron, traces of manganese oxide often form a guide in following these dykes, and at times specks of chlorite and kaolinized felspars serve to help in distinguishing the surface dyke rock from the sandstones.

Another distinguishing characteristic is its prismatic jointing.

In the Avoca railway cutting, about one mile and a quarter west of the township of Maryborough, there is a triple outcrop of dykes probably more basic than any others met with in the district (Fig. 12). It is only a few feet east of a big porphyry dyke, and both occur in the main barren sandstone belt to the west of the Western Dyke Belt. This triple dyke is very dark, nearly black in colour, and much decomposed. Crystals of biotite and hornblende decomposing to a pale-green mineral are plentiful, and along joints in the rock thin veins of dolomite are seen. On both sides of these dykes the country is indurated and the quartz veins contain crystals of felspar. This association of felspar with quartz veins is of common occurrence along the dyke lines, as, for example, at Blucher's, Mariner's, the Leviathan, the Telegraph, and other reefs.

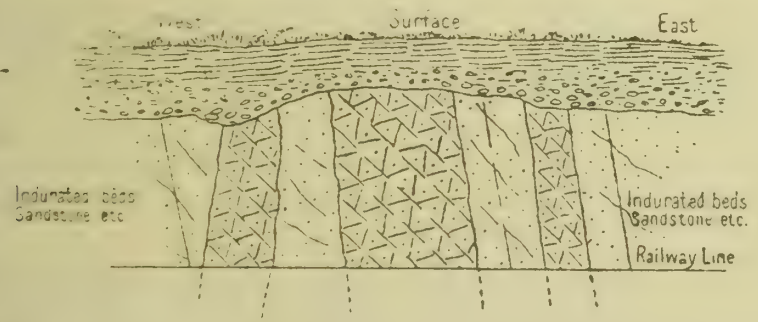



Fig. 12. Dykes in cutting, 1¼ miles west of Maryborough railway station. Scale 10 feet to 1 inch.

When traced outside the surveyed area, the belts in which the dykes are most common are found to extend in a regular direction from the granitic area of Mt. Hoogley on the N.W., to a similar area at Craigie on the S.E., a distance of about 16 miles. They appear to mark a line of weakness between these two intrusive masses.

The dykes and their relation to the quartz reefs have not hitherto been recognised in this locality, with the exception of one or two large dykes, such as the Bristol Hill porphyry. In only two cases can I find any evidence of dykes having been noticed; they were then referred to as the "Red Ground" and the "Yellow and Pug."

## 8. Quartz Reefs and Veins.

The quartz deposits vary greatly in structure, and the value of their auriferous contents will be described under the following headings:—

(1) Quartz reefs associated with lamprophyre dykes.
(2) Massive quartz spurs in defined channels.
(3) Fissure reefs.
(4) Metasomatic quartz veins in the indicators.
(5) "Cross veins" on the indicators.
(6) Vitreous quartz veins in the metamorphic areas.

(1) *Quartz Reefs associated with Dykes.*—In the Maryborough District, auriferous quartz deposits of this type are common and important. The quartz occurs along the walls of the dykes between the intrusive rock and the sedimentary rocks enclosing it, and occupies spaces which probably arose from the contraction of the intrusive rock as it cooled. The quartz does not form a continuous reef, but occurs as lenticles or blocks, sometimes on one side of the dyke sometimes on the other. The quartz is laminated, sub-vitreous in appearance, and generally very hard to crush. The blocks occur along the walls of the dykes which dip west, and for the most part strike about north and south, cutting the strata both in dip and strike. A few such reefs are formed along the walls of dykes occupying fault lines, which cut the strata nearly at right angles and dip southwards. The various shoots in different blocks, even though close to one another, may be of very different value. The gold occurs in shoots, and is not patchy.

Auriferous pyrites and galena accompany the richest shoots. The principal lines of reef belonging to this class are the Telegraph, the Frederick, and Blucher's along dykes trending north; and the Native Youth Reef along a dyke running east and west.

(2) *Massive Quartz Spurs in Channels.*—The spurs are formed of white, opaque quartz, and occur as stockworks along defined channels in the Western Dyke Belt. Some of the spurs are small, while others are several feet in width and traceable for some distance. The spurs intersect the beds at all angles, and the channels in which they occur can be followed for many chains. These reef channels have a general strike a little west of north, and are not parallel to the strike of the strata; they are generally close to a parallel lamprophyre dyke.

Where a horizontal dyke crosses these channels there is a secondary development of veins of quartz and felspar, and there is also an enrichment of the auriferous content above the intersection of the dyke and the reef. The felspar is easily distinguishable below water-level, where it occurs in the fresh state, but above water-level, and especially near the surface, it becomes kaolinized, and appears as pure white patches of kaolin amongst the quartz spurs. In these stockworks individual spurs are often very rich, while the rest of the quartz is poor, making the general yields patchy, but payable throughout on account of the great width attained by these lode-channels in some places.

Cubical crystals of pyrites commonly occur and also some galena and sphalerite.

(3) *Fissure Reefs.*—These vary in width from a few inches to several feet, and can sometimes be traced over long distances. The quartz is white, with mineralized laminations and carries fine crystals of pyrites and galena here and there in the best shoots.

These auriferous shoots are very rich in some cases, but different shoots along the same reef vary very much in value.

The main reef of this class is the Shaw's–Harper's–McFarlane's line, which is traceable for over a mile in length.

(4) *Metasomatic Quartz Veins in the Indicators.*—These veins are found only in indicator slate, where they occur parallel to the bedding. They are narrow, and composed of finely laminated quartz, but in places they widen out a little, and the lamellæ become thicker. The quartz is usually white, and saccharoidal. These veins never carry gold themselves, but a vein of pyrites in them or close by in the slate seems to have the effect of causing the deposition of gold in cross veins or floors which may intersect them.

(5) "*Cross Veins*" *on the Indicators.*—Small, nearly horizontal, veins varying from a few inches in thickness to a thread which sometimes forms only a gritty floor, cross the indicators. They are often nearly horizontal, but dip to the south at varying angles. Coarse gold and occasional nuggety patches occur in them only where they cross indicator slates.

Iron pyrites is the only common sulphide associated with veins of this type, and in no case has any galena been found with them. They are often associated with much iron oxide above water level.

The best examples of this class of vein are to be seen along Smart and Swain's indicator lines, where they occur as cross veins and quartz ironstone floors.

(6) *Vitreous Quartz Reefs.*—In the north-western metamorphic area the quartz has always a vitreous appearance, and is generally barren. On the Black Range, Rathscar, a large vitreous quartz reef with small included bunches of biotite is seen, as well as several smaller veins. Veins of this class do not seem to extend far along their strike, and all vary in thickness when traced for even short distances.

## 9. Metamorphism.

(1) *Contact Metamorphism due to Large Intrusions.*—The metamorphic rocks are mainly confined to the north-west corner of the survey, where they form the principal part of the Black Range; the south-eastern boundary of this area lies in the parish of Wareek, near Fitzgerald's, Long's, and just east of Norwood Station. (Plate I.). The metamorphism is due to the large granitic massive seen at Mt. Hoogley and the North Black Range, which has been intruded into the sedimentary Ordovician beds. The latter rocks become more altered as the granitic area is approached. The metamorphism is most apparent in the slate beds; nodules are first developed, and the beds finally become nodular schists, the composition of the new nodules being largely dependent on the mineral character of the original slates. The sandstone beds have been indurated and metamorphozed to some extent, forming at times indurated micaceous sandstones and quartzites.

All the quartz reefs in these rocks are vitreous in appearance, and the larger reefs sometimes contain small clusters of bleached biotite mica. Common iron pyrites is practically absent, but magnetic pyrites (pyrrhotite) is found associated with vitreous quartz veins in a large dyke. A sample from the Rathscar Mine, which lies just outside the limits of the Quarter Sheet, assayed as follows:—

Assay No. 384/07—

| | oz. | dwt. | grs. | |
|---|---|---|---|---|
| Gold .. .. .. | 0 | 3 | 6 | Per ton of sample, containing pyrrhotite, quartz, and dyke rock. |
| Silver .. .. .. | 0 | 1 | 10 | |

On the whole, this metamorphic area is apparently nearly void of gold.

(2) *Contact Metamorphism due to Small Intrusions such as Dykes.*—More mineralized, spotted, and pitted slates (incipient schists) occur along the lines of dykes than elsewhere, and in these beds there is also a large development of cubical pyrites, both in the slates and sandstones, especially in the case of the Western Dyke Belt, where some of the pyrites is found as cubes over 1 inch in diameter.

Along the dyke lines there is also a development of felspar crystals in small fissures and joints in the slates and sandstones and in the quartz veins associated with the dykes.

Contact metamorphism is evident in the Inkerman dredge paddock, where schist and indurated sandstone occur around a decomposed granitic boss, the component minerals of which are felspar, quartz, and mica.

At Slaughter Yard Hill, an east and west lamprophyre dyke occurs along a fault line, causing metamorphism, and here coarse mica has developed along an indicator line for a short distance in both sides of it. (Plate VII.).

## IV.—GOLD.

### The Age of the Auriferous Reefs.

In the Maryborough, as in most other Victorian mining districts, the gold is almost entirely confined to the quartz reefs or to alluvial deposits which have derived their auriferous contents from the disintegration of these reefs. The period at which the gold was deposited in the reefs can be determined only within very wide limits; auriferous reefs must have been in existence when the Older Pliocene streams ran across this district, for all the deposits formed by their action are auriferous, and it is also certain that the quartz reefs were formed after the Lower Ordovician strata had been folded. Some of the reefs and quartz spurs were formed after the intrusion of the lamprophyre dykes.

### Mode of Occurrence of the Gold.

The free gold in the reefs is either solidly embedded in the quartz or is distributed around mineral aggregations, or occurs as loose particles within the hollows formed by the leaching out of these minerals. As a rule, the particles are irregular in shape, but crystal gold is reported to have been found in the Chow Chow Reef and in the workings of the Old Leviathan Reef, both of which are directly associated with lamprophyre dykes.

Free gold is also found under three other conditions, as well as in the alluvial:—

(1) As fine specks and flour gold in green and purple slates in the Main Indicator Belt.
(2) On the oxidized faces of cubes of pyrites in slates, as, for instance, at Soldier's Hill.
(3) In some of the lamprophyre dykes various specimens were proved auriferous by assay (see below), and in one specimen examined, "paint" gold was visible on the joint faces of the dyke at Splitter's Reef. The dyke here was decomposed and stained deep red with iron oxide.

The following are the results of assays made at the Departmental Laboratory:—

| No. | Locality. | Description. | Gold per ton. | Silver per ton. |
|---|---|---|---|---|
| | | | oz. dwt. gr. | oz. dwt. gr. |
| 633 | Mariner's Flat Dyke .. .. .. | Yellow dyke rock .. .. .. | Trace | Nil |
| 556 | Splitter's Dyke (North and South line) .. | Red, ferruginous dyke rock .. .. | 0 3 14 | 0 1 2 |
| 557 | Head of Dead Horse Gully .. .. | Yellow and brown dyke rock .. | 0 0 8 | Nil |
| 558 | Native Youth Dyke (East and West line) .. | Yellow, ferruginous dyke rock .. | 0 1 5 | Trace |

Auriferous pyrites occurs in certain reefs, and is of high value in Mariner's, Blucher's, and Flagstaff reefs.

A list of minerals associated with the gold-bearing reefs in this district is appended—

| Mineral. | Remarks. |
|---|---|
| Iron Pyrites .. | Occurs throughout the quartz reefs and in some of the sedimentary beds; for instance, in slate as seams and large cubes. Some is auriferous and when concentrated is worth as much as £20 per ton. |
| Pyrrhotite (Magnetic Iron Pyrites) .. | In vitreous quartz in the metamorphic area and in rock on the western extension of the Black Range dyke. Carries gold. |
| Arsenopyrite .. | Recorded, but not commonly found. |
| Chalcopyrite .. | Occurs in a few places in the Western Dyke Belt, but is rare. |
| Galena .. .. | Occurs in most of the auriferous reefs, but most commonly in the laminated ones. |
| Stibnite .. .. | In lenticular patches at McFarlane's Reef, Havelock; recorded at Bristol Hill, Maryborough. |
| Sphalerite .. | Small crystals and aggregates occasionally found in the Western Dyke Belt; rare. |
| Psilomelane .. | Common at the surface along many of the richer reefs, and especially noticeable along the dyke lines. |
| Limonite .. | Forms large outcrops along lamprophyre dyke lines; commonly associated with "cross veins" on the indicators and with many of the Ordovician beds. |
| Felspar (Albite?) .. | Occurs in the quartz reefs which are associated with dykes. Above water-level it becomes kaolinised, and is termed by the miners "meerschaum clay." A sample from the Leviathan mine contained gold. |
| Calcite .. .. | Occurs in the lamprophyre dykes. |

### Auriferous Shoots.

No evidence could be collected to indicate the causes of the main auriferous shoots in the deeper mines or the reason of their length or pitch, but in the minor occurrences some facts bearing on this subject were observed.

1. In the case of indicators and cross veins, the shoot of gold occurs in the cross veins immediately opposite that part of the indicator that contains pyrites. This holds good whether the pyrites is in the slate or in the metasomatic vein (see p. 20).

2. In the Western Dyke Belt, where tabular horizontal offshoots from the vertical lamprophyre dykes cut across the lodes, an enrichment often occurs above the dyke. This enrichment in gold is accompanied by the appearance of felspar in the quartz and is confined to the area in which the felspar is found. There is no similar enrichment below the dyke. In one instance gold was seen in undecomposed felspar at the Leviathan Mine.

3. Along the lamprophyre dykes the auriferous shoots generally occur in the quartz when cutting slate beds; and above water level they are richest when the decomposed dyke rock is of a red and pink colour.

### Fineness of the Gold.

Throughout the district the purity of the gold varies somewhat, but on the whole it is very free from intermixture with other metals. Indicator gold is always worth over £4 per ounce, and the reef gold is also generally worth £4 per ounce, but in the case of Blucher's Reef and the Telegraph Reef it was valued at only £3 17s. 6d. per ounce.

The late Mr. George Foord* gives the result of assays of gold from numerous localities, among which are several referring to the Maryborough gold-field. His results are given in carats and carat grains; for the sake of convenience of comparison, the corresponding percentage values are here added. Under the *Coinage Act* 1909 it is provided that Australian gold coins shall contain $\frac{11}{12}$ fine gold and $\frac{1}{12}$ alloy (92·5 per cent. fine gold).

| Locality. | Carats. | Grains. | Per cent. |
|---|---|---|---|
| Chinaman's Flat .. .. | 23 | $27_8$ | 98·8 |
| Maryborough .. .. | 23 | $21_8$ | 98·0 |
| | to | | to |
| | 23 | $27_8$ | 98·8 |
| Average .. .. | 23 | $21_2$ | 98·4 |
| White Hills .. .. | 23 | $23_4$ | 98·7 |
| Mariner's Reef .. .. | 23 | $27_8$ | 98·8 |
| | to | | to |
| | 23 | $31_4$ | 99·2 |

I am indebted to the Deputy-Master of the Mint for the following information:—

At the Melbourne Mint it is not now the practice to keep special records for each district of Victorian gold, but such records were kept for a few years after the Mint was established, and the following are the figures for 63 lots of Maryborough alluvial gold:—

| — | Gold, per cent. | Silver, per cent. | Base, per cent. |
|---|---|---|---|
| Highest .. .. | 99·05 | .. | .. |
| Lowest .. .. | 93·40 | .. | .. |
| Average .. .. | 98·25 | 1·5 | 0·25 |

The highest and lowest Victorian alluvial received at the Mint has been as follows:—

| | | | |
|---|---|---|---|
| Highest .. .. | Linton .. .. .. | 99.25 per cent. fine gold | |
| | Dunolly .. .. .. | 99.25 | ,, ,, |
| Lowest .. .. | Omeo .. .. .. | 81.80 | ,, ,, |

With regard to reef gold, the Mint has no means of knowing whether the ingots brought in for coinage are from reef gold only. They may contain alluvial gold or gold which has been chemically treated.

The average assay value of all gold described as Victorian received at the Mint during the years 1906–1909 is—

Gold, 92·66 per cent. Silver, 4·17 per cent. Base, 3·17 per cent.

A considerable quantity of this gold has been extracted by the cyanide process, and as this contains a large quantity of base metal, it lowers the average assay as a whole.

* In "Fairfax's Hand-book to Australasia" (Melb., 1859); quoted by R. Brough Smyth in "The Gold-fields and Mineral Districts of Victoria" (Melb., 1869), p. 75.

## Nuggets.

The alluvial leads and surfaced ground in the Maryborough district have yielded many rich nuggets, few of which have been noted in the early records, although they are said to have been of common occurrence in many of the leads.

Mr. E. O'Farrell,* at one time Chairman of the Mining Board at Maryborough, reports generally as to the first alluvial workings at White Hills, and states: "The nuggets which could be picked out paid well," and in a further paragraph refers to some finds nearer the present township, saying: "The wash was only 4 to 6 inches thick, but in it were found splendid nuggets scattered over the white pipe-clay." In reference to the shallow leads, on the east fall towards Deep Creek, he says: "Some of these gullies yielded nuggets up to 700 ounces."

From other sources there are records of large and small nuggets; one weighing 1,034 ozs. was found in the Blackman's Lead.

Many nuggets have been found in the Main Lead, near Havelock, along Waterloo Flat, at Inkerman Lead, and at Alma.

Chinaman's Flat was noted for nuggets, and several large ones, both in the shallow and the deeper workings, have been found, especially around Timor.

The following list gives some of the nuggets and their localities in the area embraced in the Maryborough Quarter-Sheet Survey:—

| Locality. | Date. | Weight. | | | Depth. | Remarks. |
|---|---|---|---|---|---|---|
| | | Gross. | Net. | Estimated | | |
| | | oz. dwt. | oz. dwt. | oz. dwt. | Feet. | |
| Blackman's Lead, Maryborough | —.6.1855 | 1,034 5 | .. | 833 14 | 5 | Sold in Melbourne for £3,250 |
| Blackman's Lead, Maryborough | 15.1.1858 | 537 5 | .. | .. | 6 | Value £2,000 |
| White Hills, Maryborough | 1856 | 236 0 | 236 0 | .. | 12 | A solid nugget. Value £944 |
| Maryborough District .. | 1854 | 178 16 | .. | .. | .. | With ironstone and quartz |
| Mole's Dam, Inkerman Lead | 15.10.1869 | 173 12 | 160 0 | .. | 25 | On Swain's line of indicator |
| †Alma Consols Mine, Alma | 14.4.1873 | 145 14 | .. | 136 0 | 120 | Named the "Alma No. 1" |
| George's Gully, Alma South | .. | 143 0 | .. | .. | 1 | On Rowle's line of indicator |
| Humbug Lead, Timor .. | 14.6.1878 | 131 0 | 127 10 | .. | 40 | Found by Adlow and party |
| Chinaman's Flat, Timor .. | 3.12.1872 | 126 10 | 126 0 | .. | 120 | On a mullock heap. Magnum Bonum Co. |
| Havelock .. .. | 18.10.1878 | 108 0 | 84 0 | .. | 3 | |
| East Duke Co-operative Mine, Timor | —.12.1877 | 65 0 | 65 0 | .. | Deep | |
| Welcome Gully, Maryborough | 19.10.1871 | 55 0 | .. | 54 0 | 4 | Found by Alfred Cole, Mariner's Hill |
| †Well-in-Desert Lead, Timor | 1.6.1906 | 50 0 | .. | .. | 90 | Found by Pollock and party |
| Magnum Bonum Extended, Timor | 14.5.1867 | 51 0 | .. | .. | 120 | |
| †Band of Hope Mine, Timor | 1.2.1877 | 50 19 | .. | .. | Deep | |
| Alma Consols Mine, Alma | 31.5.1873 | 47 9 | .. | 45 0 | 120 | A honeycombed nugget with black cement |
| †Inkerman Lead, Maryborough | 13.6.1906 | 41 10 | .. | .. | 16 | Found by Inkerman Dredging Co. close to a granitic boss and on Chadwick's line of indicator |
| Griffiths Lead, Maryborough | .. | 40 2 | .. | .. | 6 | Found on a lamprophyre dyke bedrock |
| Band of Hope Mine, Timor | 10.7.1873 | 39 15 | .. | 39 0 | Deep | |
| Havelock Lead, Havelock | 18.7.1911 | 35 7 | | | | |
| Dead Horse Lead, Maryborough | 28.8.1873 | 32 0 | .. | 31 10 | 6 | Found by Passoli and party |
| †Band of Hope Mine, Timor | 11.3.1871 | 30 1 | .. | 29 5 | Deep | Named "The Virtue" |
| Madman's Lead, Maryborough | .. | 30 0 | .. | .. | 15 | Near J. Clough's garden, and close to Ellis' lamprophyre dyke line |
| Seaham Mine, Alma .. | 1.3.1872 | 28 16 | .. | 27 10 | Deep | A honeycombed nugget |
| Adelaide Lead .. .. | 27.6.1862 | 25 0 | | | | |
| Band of Hope Mine, Timor | 5.3.1872 | 22 6 | .. | 22 0 | .. | Amongst several other smaller nuggets |
| Well-in-Desert Lead, Timor | 1.6.1906 | 20 0 | .. | .. | 90 | Found by Pollock and party |
| †Alma Consols Mine, Alma | 14.4.1873 | 19 10 | 15 0 | .. | 120 | Named the "Alma No. 2" |
| Palmer's Hill, Havelock .. | .. | 17 10 | .. | .. | At surface | |
| Seaham Mine, Alma .. | 2.3.1872 | 11 0 | .. | .. | 70 | A flat nugget |
| Madman's Lead, Maryborough | .. | 10 0 | .. | .. | 15 | Near J. Clough's garden, and close to Ellis' lamprophyre dyke line |
| Arents Hill, Havelock .. | .. | 6 0 | .. | .. | At surface | |
| Havelock Flat .. .. | .. | 6 0 | .. | .. | 6 | Together with other smaller nuggets |
| Seaham Mine, Alma .. | .. | 4 10 | .. | .. | Deep | |

* Brough Smyth's *Goldfields and Mineral Districts of Victoria.* † Exact casts of these nuggets are kept in the Geological Survey Museum.

Other localities where nuggets have been found are:—

1. Near Blucher's Reef, east down Blucher's gully.
2. Nuggety Gully, near Soldier's Hill, where nuggets of 25 ozs., 10 ozs., &c., are said to have been obtained.
3. Bristol Hill, near the Old Cemetery, and at the head of California Lead. (Large nuggets).
4. Leviathan Reef, between McCann's Reef and Denyer's.
5. George's Gully, south-west of Alma, Slaughter Yard Hill, and Coate's Gully, north-west of Alma.
6. Near Willet's allotment, Inkerman Lead, 45 oz., &c.

## V.—QUARTZ REEF MINING.

Although a number of quartz reefs have been worked with very profitable results from the fifties till the present day, yet only a few of them have been prospected or developed below water-level.

At the times when other gold-fields were systematically developing their quartz at a depth, the great alluvial prosperity around Maryborough obscured the importance of the reefing, and only a little capital came for deep quartz development. This is one of the causes of the neglected state of quartz mining at a depth around Maryborough.

The following list records the more important mines worked below water-level in the surveyed area :—

| Reef. | Deepest Workings. |
|---|---|
| New Leviathan Reef .. .. | 960 feet |
| Mariner's Reef .. .. .. | 800 feet |
| Blucher's Reef .. .. .. | 786 feet |
| Bristol Hill Reef .. .. | 630 feet |
| Shaw's Reef .. .. .. | 510 feet |
| Flagstaff Reef .. .. .. | 425 feet |
| Telegraph Reef .. .. .. | 400 feet |
| McFarlane's Reef .. .. | 350 feet |

Besides these there are several worked at a depth of over 200 feet, such as the Frederick, Native Youth, Amy Castles, North German, Old Leviathan, Rob Roy, and Ellery and Passmore's Reefs.

In addition to the above there is a number of less importance above water-level.

At present the only deep quartz mine working in the district is Mariner's Reef, but possibly Blucher's Reef and others will again be developed. The appended reports have been made from information collected from the best local authorities, old plans, and past managers' reports, together with the field surveys and inspections of old workings. The yields have been compiled from the *Maryborough Advertiser*, and though in many cases incomplete, can be taken as reliable records.

### 1.—New Leviathan Reef Line.

This line of reef was found on the western side of Chinaman's Flat Lead, about 1¼ miles in a northerly direction from the township of Maryborough. It is in the Western Dyke Belt and is subject to the influence of adjacent dykes.

The strike of the reef in the workings is N. 22° W., and the dip is 70° westerly, cutting across beds which dip eastward, down to the 360-foot level, where it gradually narrowed to a few feet and became vertical, and in deeper levels it dipped eastward at an angle of 85°.

This is known as the Western Reef Formation, and was very profitably worked by the earlier claims, such as Snowdon's, Dark and Sharpe's, Judd and Barry's, and the Sharpe and Barry Amalgamated Gold Mining Company.

The New Leviathan Company then worked the narrower downward extension of the Western Reef, which proved unprofitable, the stone being very poor though up to 4 feet wide.

Subsequently, in 1899, the Maryborough Leviathan Gold Mines Company Ltd. was formed to work at deeper levels and to open up the mine to the south. Then followed the discovery of a large formation of quartz spurs at a short distance to the east of the main reef formation ; these spurs proved payable for a long time. The formation was very extensive between the 300-foot and 400-foot levels, where it was known as the "Eastern Reef Formation." It dipped eastward at about 70° on the average, and below 400 feet it was again carried over by a western dipping vein, which nearly joins with the main Western Reef at 500 feet deep. Before describing the workings carried out by the big English company a short account of the claims in the upper levels will be given.

*Snowdon's Claim.*—This claim was worked to a depth of 310 feet and the reef formation was stoped to within 40 feet of the surface.

The dip of the main formation is 70° westward, and the strike is N. 22° W.

The formation of sandstone, slate, and quartz spurs would average 6 feet wide, and some yields of nearly 2 ozs. of gold per ton were obtained, and the total yield given by Mr. Snowdon is 5,249 ozs., worth over £20,000.

*Ten Men's Claim.*—This claim was worked for eight years, operations being carried on from several prospecting shafts and a main shaft 296 feet deep. In this claim the dip and strike were the same as in Snowdon's and Barry's claims, but the average width was about 5 feet. The run of payable quartz spurs pitched to the south, and yields of about 1 oz. per ton were obtained, such as 121 tons for 115 ozs. for a fortnight's work.

*Dark and Sharpe's Claim.*—A claim extending 600 feet along the line of reef was held by Dark and Sharpe, who worked it from 1890 to 1895, when an amalgamation with Judd and Barry's claim was effected. Many yields of over 1 oz. per ton were obtained.

*Judd and Barry's Claim.*—This claim held 400 feet along the line and was worked by itself from 1890 to 1895, when amalgamation with Dark and Sharpe's mine took place. Whilst this claim worked, the yields were well over 1 oz. of gold per ton, and one very rich yield (85 tons for 325 ozs. 15 dwt.) is recorded. In 1895 the two claims, Sharpe's and Barry's, were amalgamated and worked for several years under the title of the Sharpe and Barry Amalgamated Gold Mining Co.

*The Sharpe and Barry Amalgamated Gold Mining Co.*—The main shaft of the amalgamated company was sunk to a depth of 365 feet, passing through water-level at 144 feet deep. The dip of the Western Reef Formation was 70° westward cutting across easterly dipping beds, but eventually the dip of the reef became vertical to 85° east, after meeting the western wall country (now determined as a big dyke). The width of spurry formation stoped varied from a few feet to 24 feet at about the 300-ft. level. At 360 feet deep, the formation became much narrower and carried few payable spurs. At a depth of 288 feet, and 100 feet from the south boundary, this claim worked some very rich spurs, amongst which was a pocket of 200 ozs. of specimens, which yielded 138 ozs. 8½ dwts. of smelted gold (May, 1896). The records of the former claims collected by the English company in 1897, state that 38,495 tons was crushed for a return of 21,231 ozs. of gold, valued at over £84,000. During the period of amalgamation the company sunk and timbered a good main shaft, erected pumping and winding machinery, and an up-to-date 20-head battery, tables, &c.

*New Leviathan Co.*—This company was formed in 1890 and worked until 1897, but during that time no dividends were paid. The main shaft was sunk to a depth of 420 feet, and several of the drives were holed through to Sharpe and Barry's Amalgamated Company on the north. The reef formation averaged 4 feet wide, but the spurs were poor and much broken. Gold to the value of about £400 was obtained, and the last crushings were worth only 2 dwts. per ton. The following yields have been compiled from the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Yield. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| *Snowdon's Claim—Leviathan Reef.* | | | | |
| 31st December, 1889 .. .. | 40 | 36 | 0 | |
| 11th May, 1891 .. .. .. | 55 | 17 | 12 | |
| 21st September, 1891 .. .. | 96 | 151 | 5 | |
| 19th October, 1891 .. .. | 88 | 143 | 7 | |
| 16th November, 1891 .. .. | 83 | 83 | 3 | |
| Year 1891 .. .. .. | 611 | 563 | 0 | Yearly return |
| 28th March, 1892 .. .. | 168 | 151 | 4 | |
| 30th June, 1892 .. .. .. | 325 | 174 | 2 | Quarterly return |
| 1st August, 1892 .. .. | 280 | 185 | 6 | |
| 29th August, 1892 .. .. | 70 | 65 | 0 | |
| 30th September, 1892 .. .. | 270 | 164 | 5 | |
| 31st October, 1892 .. .. | 122 | 53 | 3 | |
| 14th November, 1892 .. .. | 140 | 52 | 3 | |
| 11th December, 1892 .. .. | 88 | 73 | 0 | |
| 31st December, 1892 .. .. | 163 | 49 | 18 | |
| 31st March, 1893 .. .. | 147 | 89 | 0 | Quarterly record |
| 31st December, 1893 .. .. | 253 | 194 | 15 | |
| 29th January, 1894 .. .. | 90 | 63 | 0 | |
| 5th March, 1894 .. .. .. | 96 | 48 | 0 | |
| 23rd April, 1894 .. .. .. | 90 | 42 | 18 | |
| 14th May, 1894 .. .. .. | 100 | 56 | 0 | |
| 25th June, 1894 .. .. .. | 200 | 123 | 0 | |
| 23rd July, 1894 .. .. .. | 91 | 37 | 16 | |
| 13th August, 1894 .. .. | 90 | 44 | 0 | |
| 20th August, 1894 .. .. | 98 | 68 | 10 | Fortnight yield |
| 30th September, 1894 .. .. | 119 | 152 | 0 | |
| 14th January, 1895 .. .. .. | 100 | 57 | 0 | |
| 4th February, 1895 .. .. | 90 | 45 | 10 | |
| 30th March, 1895 .. .. | 150 | 93 | 15 | |
| 17th June, 1895 .. .. .. | 70 | 28 | 0 | |
| 22nd July, 1895 .. .. .. | 125 | 57 | 14 | |
| 5th August, 1895 .. .. | .. | 68 | 15 | Fortnight |
| 19th August, 1895 .. .. | 127 | 87 | 0 | |
| 28th October, 1895 .. .. | .. | 111 | 0 | Fortnight |
| 11th November, 1895 .. .. | .. | 94 | 0 | ,, |
| 25th November, 1895 .. .. | .. | 100 | 0 | ,, |
| 2nd December, 1895 .. .. | .. | 107 | 0 | |
| 23rd December, 1895 .. .. | .. | 121 | 0 | Fortnight |
| 30th December, 1895 .. .. | .. | 94 | 9 | |
| 30th September, 1895 .. .. | 452 | 217 | 0 | Quarterly record |
| 30th March, 1896 .. .. | .. | 415 | 8 | ,, |
| 30th June, 1896 .. .. .. | .. | 169 | 10 | ,, |
| 30th September, 1896 .. .. | .. | 308 | 19 | ,, |
| 31st December, 1896 .. .. | .. | 299 | 16 | ,, |
| 18th January, 1897 .. .. | .. | 45 | 2 | Fortnight |
| 29th March, 1897 .. .. | .. | 38 | 0 | ,, |
| 31st March, 1897 .. .. | .. | 132 | 5 | Balance during Quarter |
| 30th June, 1897 .. .. .. | .. | 215 | 0 | Quarterly record |
| 30th June, 1897 .. .. .. | .. | 31 | 0 | ,, |
| 26th July, 1897 .. .. .. | 150 | 48 | 0 | |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Yield. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| *Ten Men's Claim—Leviathan Reef.* | | | | |
| 15th January, 1894 .. .. | 134 | 103 | 14 | Sharpe |
| 5th February, 1894 .. .. | 121 | 115 | 0 | Fortnight |
| 19th February, 1894 .. .. | 119 | 93 | 4 | |
| 26th February, 1894 .. .. | 116 | 57 | 18 | |
| 12th March, 1894 .. .. | 122 | 51 | 0 | |
| 26th March, 1894 .. .. | 130 | 40 | 6 | |
| 9th July, 1894 .. .. .. | 249 | 145 | 10 | |
| 6th August, 1894 .. .. | .. | 34 | 3 | |
| 20th August, 1894 .. .. | .. | 46 | 4 | Fortnight |
| 3rd September, 1894 .. .. | .. | 31 | 0 | |
| 31st December, 1894 .. .. | 690 | 530 | 8 | Quarterly return |
| 28th January, 1895 .. .. | .. | 65 | 0 | |
| 28th October, 1895 .. .. | 25 | 3 | 4 | |
| 30th March, 1896 .. .. | 1,859 | 702 | 0 | Quarterly return |
| 30th June, 1896 .. .. .. | 2,741 | 733 | 6 | ,, |
| 30th September, 1896 .. .. | 3,010 | 359 | 4 | ,, |
| 31st December, 1896 .. .. | .. | 143 | 0 | ,, |
| 31st March, 1897 .. .. | 300 | 117 | 0 | ,, |
| 30th June, 1897 .. .. .. | .. | 31 | 0 | ,, |
| 31st September, 1897 .. .. | .. | 72 | 6 | ,, |
| *Dark and Sharpe's Claim—Leviathan Reef.* | | | | |
| 30th June, 1890 .. .. .. | 40 | 42 | 0 | Dark and Sharpe's Claim, 90 feet level, 3 feet thick |
| 18th August, 1890 .. .. | .. | 30 | 0 | |
| 29th August, 1890 .. .. | 117 | 120 | 10 | |
| 24th December, 1890 .. .. | 97 | 101 | 17 | |
| 30th January, 1891 .. .. | 125 | 170 | 0 | |
| 31st March, 1891 .. .. | 343 | 405 | 0 | |
| 18th May, 1891 .. .. .. | 120 | 123 | 0 | |
| 10th August, 1891 .. .. | 118 | 146 | 10 | |
| 31st August, 1891 .. .. | 135 | 193 | 0 | |
| 14th September, 1891 .. .. | 627 | 932 | 10 | |
| 31st September, 1891 .. .. | 269 | 349 | 10 | |
| 21st September, 1891 .. .. | 136 | 153 | 0 | |
| 26th October, 1891 .. .. | 144 | 168 | 0 | |
| 23rd November, 1891 .. .. | 72 | 53 | 0 | |
| 16th January, 1892 .. .. | 104 | 26 | 17 | |
| 29th January, 1892 .. .. | .. | 400 | 0 | (Amalgam) |
| 8th February, 1892 .. .. | .. | 291 | 5 | |
| 21st March, 1892 .. .. | 138 | 109 | 6 | |
| 25th May, 1892 .. .. .. | 125 | 61 | 1 | |
| 18th July, 1892 .. .. .. | 140 | 103 | 4 | |
| 29th August, 1892 .. .. | 160 | 200 | 8 | |
| 14th November, 1892 .. .. | 140 | 99 | 0 | |
| 31st December, 1892 .. .. | 142 | 180 | 0 | |
| 31st March, 1893 .. .. | 112 | 179 | 0 | |
| 14th August, 1893 .. .. | 125 | 160 | 0 | |
| 28th August, 1893 .. .. | 124 | 103 | 0 | |
| 11th September, 1893 .. .. | 126 | 70 | 15 | |
| 25th September, 1893 .. .. | 113 | 124 | 0 | Fortnight |
| 16th October, 1893 .. .. | 125 | 74 | 10 | |
| 23rd October, 1893 .. .. | 106 | 131 | 0 | Fortnight |
| 6th November, 1893 .. .. | 114 | 114 | 0 | ,, |
| 20th November, 1893 .. .. | 102 | 64 | 5 | ,, |
| 1st December, 1893 .. .. | 136 | 67 | 10 | ,, |
| *Barry and Judd's Claim—Leviathan Reef*—continued. | | | | |
| 26th January, 1891 .. .. | 126 | 108 | 0 | |
| 23rd February, 1891 .. .. | 130 | 116 | 0 | |
| 23rd February, 1891 .. .. | 112 | 112 | 5 | |
| 29th March, 1891 .. .. | 85 | 325 | 15 | |
| 29th May, 1891 .. .. .. | 205 | 332 | 0 | |
| 15th June, 1891 .. .. .. | 132 | 192 | 10 | |
| 29th June, 1891 .. .. .. | 90 | 101 | 12 | |
| 13th July, 1891 .. .. .. | 137 | 164 | 0 | |
| 3rd August, 1891 .. .. | 145 | 173 | 10 | |
| 7th August, 1891 .. .. | 150 | 180 | 2 | |
| 14th September, 1891 .. .. | 230 | 233 | 9 | |
| 18th September, 1891 .. .. | 137 | 120 | 1 | |
| 24th December, 1891 .. .. | 492 | 580 | 0 | Quarterly return |
| 25th January, 1892 .. .. | 380 | 283 | 10 | |
| — March, 1892 .. .. | 300 | 248 | 15 | |
| 11th April, 1892 .. .. .. | 260 | 303 | 7 | |
| 10th May, 1892 .. .. .. | 275 | 282 | 13 | |
| 30th June, 1892 .. .. .. | 133 | 115 | 16 | |
| 10th June, 1892 .. .. .. | 132 | 130 | 14 | |
| 11th July, 1892 .. .. .. | 249 | 148 | 17 | |
| 15th July, 1892 .. .. .. | 150 | 77 | 12 | |
| 26th September, 1892 .. .. | 246 | 148 | 12 | |
| 30th September, 1892 .. .. | 241 | 110 | 0 | Balance of Quarterly return |
| 7th November, 1892 .. .. | 35 | 56 | 17 | Included in Quarterly return |
| 8th November, 1892 .. .. | 330 | 257 | 8 | ,, .. ,, |
| 31st December, 1892 .. .. | 974 | 832 | 0 | Quarterly return |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| *Barry and Judd's Claim—Leviathan Reef.* | | | |
| 6th February, 1893 .. .. | 180 | 85 0 | |
| 20th February, 1893 .. .. | .. | 78 0 | |
| 6th March, 1893 .. .. .. | 148 | 81 8 | |
| 20th March, 1893 .. .. | 142 | 96 12 | |
| 3rd April, 1893 .. .. .. | 114 | 70 4 | |
| 1st May, 1893 .. .. .. | 132 | 66 19 | |
| 10th July, 1893 .. .. .. | 114 | 63 0 | |
| 27th July, 1893 .. .. .. | 138 | 36 0 | |
| 21st August, 1893 .. .. | 135 | 44 10 | |
| 18th September, 1893 .. .. | 122 | 74 1 | |
| 2nd October, 1893 .. .. | 125 | 50 10 | |
| 16th October, 1893 .. .. | 105 | 36 11 | Fortnight |
| 30th October, 1893 .. .. | 113 | 55 2 | ,, |
| 13th November, 1893 .. .. | 116 | 48 0 | ,, |
| 27th November, 1893 .. .. | 97 | 48 0 | ,, |
| 18th December, 1893 .. .. | 120 | 75 15 | ,, |
| 8th January, 1894 .. .. | 130 | 47 0 | ,, |
| 24th January, 1894 .. .. | 152 | 84 13 | ,, |
| 12th February, 1894 .. .. | 130 | 60 13 | ,, |
| 19th March, 1894 .. .. | 143 | 53 0 | |
| 24th April, 1894 .. .. .. | 32 | 10 0 | |
| 1894 .. .. .. .. | 356 | 245 18 | Being balance crushed in first half year, besides above |
| 30th September, 1894 .. .. | 301 | 301 6 | Quarter |
| 15th October, 1894 .. .. | .. | 89 17 | |
| 29th October, 1894 .. .. | .. | 103 3 | |
| 12th November, 1894 .. .. | .. | 122 8 | |
| *Sharpe and Barry Amalgamated G. M. Co.—Leviathan Reef.* | | | |
| 25th February, 1895 .. .. | .. | 131 5 | Sharpe and Barry Amalgamated G.M. Co. |
| 18th March, 1895 .. .. | .. | 128 10 | |
| 27th May, 1895 .. .. .. | .. | 106 0 | Fortnight |
| 30th May, 1895 .. .. .. | .. | 104 0 | |
| 10th June, 1895 .. .. .. | .. | 119 15 | |
| 24th June, 1895 .. .. .. | .. | 203 0 | |
| 22nd July, 1895 .. .. .. | .. | 304 0 | |
| 5th August, 1895 .. .. | .. | 196 0 | |
| 19th August, 1895 .. .. | .. | 178 10 | Fortnight |
| 30th September, 1895 .. .. | .. | 107 0 | ,, |
| 14th October, 1895 .. .. | .. | 76 0 | ,, |
| 28th October, 1895 .. .. | .. | 66 5 | |
| 2nd December, 1895 .. .. | .. | 91 15 | |
| 20th December, 1895 .. .. | .. | 61 0 | |
| 6th January, 1896 .. .. | .. | 103 10 | |
| 20th January, 1896 .. .. | .. | 155 0 | |
| 27th January, 1896 .. .. | .. | 139 2 | |
| 17th February, 1896 .. .. | .. | 133 17 | |
| 2nd March, 1896 .. .. | .. | 87 19 | |
| 16th March, 1896 .. .. | .. | 82 0 | Fortnight |
| 13th April, 1896 .. .. .. | .. | 73 0 | |
| 27th April, 1896 .. .. .. | .. | 66 1 | |
| 20th May, 1896 .. .. .. | Patch of specimens | 136 8½ | 200 ozs. of specimens yielded 136 ozs. 8½ dwts. of gold |
| 25th May, 1896 .. .. .. | .. | 98 4 | Fortnight |
| 8th June, 1896 .. .. .. | .. | 81 0 | ,, |
| 22nd June, 1896 .. .. | .. | 106 0 | |
| 13th July, 1896 .. .. .. | .. | 73 10 | Fortnight |
| 17th August, 1896 .. .. | .. | 79 10 | |
| 31st August, 1896 .. .. | .. | 70 2 | |
| 28th September, 1896 .. .. | .. | 35 18 | Fortnight |
| 12th October, 1896 .. .. | .. | 44 10 | |
| 26th October, 1896 .. .. | .. | 80 11 | Fortnight |
| 16th November, 1896 .. .. | .. | 55 0 | ,, |
| 23rd November, 1896 .. .. | .. | 49 4 | |
| 21st December, 1896 .. .. | .. | 90 0 | |
| 23rd January, 1897 .. .. | 286 | 72 0 | |
| 29th January, 1897 .. .. | 210 | 60 11 | |
| 26th April, 1897 .. .. .. | 50 | 4 18 | No. 1 Tribute |
| 10th May, 1897 .. .. .. | 37 | 12 18 | ,, |
| 10th May, 1897 .. .. .. | 25 | 4 1 | No. 2 Tribute |
| 24th May, 1897 .. .. .. | 39 | 16 16 | No. 1 Tribute |
| 7th June, 1897 .. .. .. | 19 | 9 5 | No. 2 Tribute |
| 7th June, 1897 .. .. .. | 15 | 2 4 | ,, |
| *New Leviathan Co.—Leviathan Reef.* | | | |
| 30th June, 1896 .. .. .. | 9 | 13 19 | New Leviathan Co. Quarterly record |
| 30th September, 1896 .. .. | 30 | 13 5 | ,, ,, ,, ,, |
| 30th December, 1896 .. .. | 22 | 43 17 | ,, ,, ,, ,, |
| 31st May, 1897 .. .. .. | 4 | 2 2 | |
| 13th September, 1897 .. .. | 14 | 9 13 | |
| 6th December, 1897 .. .. | 6 | 5 13 | |
| 31st December, 1897 .. .. | 9 | 7 1 | |

## 2. The Maryborough Leviathan Gold Mines Limited.

A general account of the upper workings and the earlier yields has already been given under the heading of the New Leviathan Reef which was worked prior to the formation of this English company in September, 1899.

### *New Leviathian Line.*

As already stated, the reef formations strike N. 22° W., and the dip of the Western Reef changes from 70° W. to vertical and then eastwards in the lower levels. The spurs of quartz were most profitable where the reef dips to the west and crosses the eastern dipping beds.

From the surface to a depth of 360 feet, the Western Reef dipped westward at an angle of 60° to 70°. It had a good hanging wall and a broken spurry footwall.

A section taken by Mr. W. Nicholas, opposite the "A" shaft and 560 feet north of the main shaft shows the varying width of the lode to be as follows :—

| Depth. | Width of Lode. | Remarks. |
|---|---|---|
| 140-ft. level .. | 10 feet | Mostly quartz spurs |
| 220-ft. level .. | 14 feet | ,, ,, |
| 300-ft. level .. | 30 feet | ,, ,, |
| 360-ft. level .. | 5 feet | ,, ,, |

In this section the reef formation appears as a false inverted saddle with two legs, the one furthest west being short, and an attenuated reef continued down below the false saddle.

From these levels on the Western Reef formation the yields are stated to be, approximately, 51,218 tons for 26,943 ozs. of gold.

This company obtained its best yields from the large Eastern Reef formation and got very little gold from the Western Reef, which was vertical, narrow, and unpayable from the 360-ft. level to the 560-ft. level. Between the same levels the Eastern Reef was payably mined for several years. Just below the 560-ft. level the Eastern and Western Reefs joined and then the narrower channel dips to the east at a high angle.

The main shaft is 960 feet deep, and several cross-cuts and levels have been driven. At a depth of 730 feet in the main shaft, a strike fault (known as the break) was cut; at the 800-ft. level cross-cut the fault was again cut 60 feet in from the shaft, and also in the 960-ft. crosscut at 250 feet from the shaft.

| Crosscut. | Distance along Crosscut from Shaft at which Dyke and Reefs were Cut. | | | |
|---|---|---|---|---|
| | Dyke. | Western Reef. | Eastern Reef. | Other Reefs and Veins. |
| 360-ft. level .. | 120 feet (formerly called the "western wall") | 170 feet | 290 feet (10 feet wide) | |
| 460-ft. level .. | 124 feet .. .. | 150 feet | 195 feet (6 feet wide) | |
| 560-ft. level .. | 135 feet .. .. | 165 feet | 240 feet (cut spars of no value) | A reef channel at 35 feet |
| 700-ft. level .. | 165 feet .. .. | .. | .. .. .. | A small reef channel at 35 feet; also big quartz spurs at 210 feet |
| 800-ft. level .. | 180 feet .. .. | .. | .. .. .. | Quartz at 60 feet and at 240 feet; a big quartz formation of no value |
| 960-ft. level .. | .. .. .. | .. | .. .. .. | (1) 250 feet, quartz spurs, unpayable; (2) 455 feet, Middle Reef; (3) 520 feet, New Reef |

The crosscut at the 960-ft. level cut the break at 250 feet, but did not pass through the dyke ("Western Wall"), although a few broken fragments of dyke rock were seen amongst some broken quartz spurs just above the break. A trial crushing of these spurs proved unpayable.

A quartz vein (the Middle Reef) was also cut at 455 feet in from the shaft. At 520 feet in, a body of quartz spurs known as the New Reef was opened up; it pinched out 22 feet above the level, but underfoot there is now a strong formation 6 feet wide on the Old Leviathan line and carrying gold in one spur. It appears that this New Reef formation will be extensive and similar in character to the large spurry formations peculiar to the Western Dyke Belt.

### *Stoped Ground on the Western and Eastern Reef Formations.*

From the upper levels in the earlier workings, before the formation of the English company, 49,344 tons was stoped out on the Western Reef formations pitching south.

The stopes subsequently taken out from the reef formations below the 300-ft. level are as follows :—

| | |
|---|---|
| Between the 300-ft. level and 380-ft. level .. | Stoped out from "A" shaft to main shaft. |
| Between the 360-ft. level and 510-ft. level .. | Stoped out for 230 feet north of main shaft. |
| Between the 400-ft. level and 560-ft. level .. | Stoped out for 530 feet south of main shaft, excepting a block between 460 feet and 560 feet near the break |
| Between the 560-ft. level and 960-ft. level .. | Only a little stoping has been done at the 700-ft. level, at a point 340 feet south of shaft, about 170 feet long by 40 feet high; and a little stoping at the bottom level on the New Reef. |

*The New Reef (Old Leviathan Line).*

The New Reef cut at 520 feet in the bottom level crosscut is on the Old Leviathan line of reef formation, which has proved so rich to the north of this mine.

A small spurry quartz formation was mined to a depth of 120 feet in the Great Leviathan mine, about 12 chains to the north of this mine, showing that the line of the Old Leviathan Reef continues southwards.

The long eastern crosscut at the 220-ft. level, which was put in during the early mining operations, cut odd spurs on the line of the Old Leviathan Reef at about 500 feet in from the "A" shaft. These spurs carried gold to the extent of 1 dwt. per ton.

Directly below, in the 460-ft. level, main shaft, a few channels or fissures bringing in water and gas were cut, but not a prospect of gold was obtained, although here also the Old Leviathan formations should have been intersected.

The New Reef in the 960-ft. level warrants further exploiting, and this should be done if ever the mine is again worked.

A crushing of several hundreds of tons averaged only 2 dwt. per ton, but only the top of the formation was tested, and the stone might improve below. It should be noted that the 3-in. spur carrying the gold also contained sulphides of zinc, iron, copper, and lead, in small crystals, scattered through it, and that this is a favorable sign in the Leviathan Reef spurs of quartz.

*The Middle Reef.*

At about 340 feet east of the shaft there is a small laminated quartz reef lying between the Western Reef formation and the New Reef. It is nearly vertical as a rule, and only a few inches in width, but its line is very true and can be traced for over a mile in the workings along Chinamen's Flat, always lying to the west of the Old Leviathan line.

In this mine the Middle Reef carried coarse gold, zinc blende, galena, and pyrites, but was too narrow to work to any extent. In Snowdon's claim, where it was 6 inches wide, 100 tons was crushed for a yield of 1 oz. per ton.

The beds, wherever noted, dipped to the east at an angle of 65° to 70°.

*Dykes, Leviathan Reef.*

At nearly all the levels, except the 960-ft. level, a big dyke (known formerly as the "Western Wall") was cut; it is nearly vertical at the 360-ft. level, but below that it dips to the east at an angle of 80°. It is, on the average, 12 feet wide, but may be less near the surface. It is one of the two main igneous intrusions in the mine, and has been identified as a lamprophyre.

At the bottom level, 65 feet west of the New Reef, there is a similar dyke 15 feet wide. This dyke dips 60° eastwards and should eventually cut the New Reef, which is vertical. In the New Reef channel there is much felspar which indicates its connexion with an igneous dyke and which is often an indication of gold in this belt. This 15-ft. dyke is probably the continuation of the Old Leviathan dyke which can be seen at the surface in several places.

Besides the main dykes, there are lateral offshoots of dyke rock, apparently originating from the 15-ft. dyke. The principal lateral offshoot is seen at 500 feet deep, opposite the main shaft, cutting the strata and reef formations. It passes underfoot in the 510-ft. level, at a point 150 feet south of the main shaft, and is nearly horizontal in places but dips a little to the south-east. It was again cut in the 560-ft. level at a point 300 feet south of the main shaft. It cut the Eastern Reef, but is reported to have pinched out before reaching the Western Reef, thus pointing to its origin from the 15-ft. main dyke in the Old Leviathan channel. The pitch of the payable quartz followed this dyke offshoot south at an angle of 7°, the spurs being payable above, but poorer below.

At the 700-ft. level another lateral offshoot is recorded, but the quartz spurs being small and poor where cut through, very little prospecting was done above the dyke. This offshoot is said to be pitching north.

*Yields from the New Leviathan Reef when worked by the English Company.*

The yields have been very payable in the Eastern Reef formation, but the attenuated portion of the Western Reef did not prove payable. Although the formation at the 700 ft. level proved in the main unpayable, there was one large quartz block, 2,500 tons of which yielded 5 dwts. per ton. The total

amount of quartz mined by the Maryborough Leviathan Gold Mines Co. Limited on the Eastern and Western Reef formations and some isolated spurs of quartz, is reported as 110,174 tons, which yielded 29,390 ozs. of gold, an average of 5·33 dwts. per ton. Thus, from the Eastern and Western Reefs, between the surface and the deepest levels, this one mine has yielded—

| | Ore—Tons. | Gold—Ozs. | Average per Ton. |
|---|---|---|---|
| Early Claims .. .. .. | 38,495 | 21,231 | 11·03 dwts. |
| English Company .. .. .. | 110,174 | 29,390 | 5·33 „ |
| | 148,669 | 50,621 | |

The approximate value of the gold is £202,500, and the average yield throughout 6·8 dwts. per ton. The following yields are taken from the *Maryborough Advertiser* and records supplied by Mr. W. Nicholas, manager of the Maryborough Leviathan Gold Mines Co. Limited:—

| Date. | Ore crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Total. | ozs. dwts. | |
| | *Maryborough Leviathan Gold Mines Ltd.* | | |
| 28th May, 1900 .. .. .. | 85 | 58 0 | |
| 30th June, 1900 .. .. .. | 102 | 28 19 | |
| 16th July, 1900 .. .. .. | 122 | 60 18 | |
| 10th August, 1900 .. .. | 163 | 74 9 | |
| 26th September, 1900 .. .. | 215 | 62 0 | |
| 30th December, 1900 .. .. | 567 | 193 10 | |
| 28th January, 1901 .. .. | 201 | 65 10 | |
| 18th February, 1901 .. .. | 5 | 4 19 | |
| 10th March, 1901 .. .. | 138 | 36 0 | |
| 3rd June, 1901 .. .. .. | .. | 66 0 | |
| 20th July, 1901 .. .. .. | 180 | 83 10 | East lode, bottom level |
| 12th August, 1901 .. .. | 180 | 100 0 | |
| 9th September, 1901 .. .. | 200 | 83 2 | |
| 23rd September, 1901 .. .. | 250 | 100 2 | |
| 30th September, 1901 .. .. | 265 | 150 6 | |
| 6th January, 1902 .. .. | 93 | 93 17 | |
| 27th January, 1902 .. .. | 648 | 192 0 | |
| 10th February, 1902 .. .. | 600 | 152 0 | |
| 24th February, 1902 .. .. | 650 | 226 13 | |
| 10th March, 1902 .. .. | 660 | 215 12 | |
| 24th March, 1902 .. .. | 650 | 218 5 | |
| 21st April, 1902 .. .. .. | 640 | 183 15 | |
| 5th May, 1902 .. .. .. | 660 | 193 0 | |
| 2nd June, 1902 .. .. .. | 700 | 258 5 | |
| 16th June, 1902 .. .. .. | 690 | 241 10 | |
| 30th June, 1902 .. .. .. | 690 | 253 15 | |
| 14th July, 1902 .. .. .. | 700 | 251 0 | |
| 28th July, 1902 .. .. .. | 700 | 211 15 | |
| 11th August, 1902 .. .. | 700 | 212 10 | |
| 25th August, 1902 .. .. | 715 | 262 10 | |
| 22nd September, 1902 .. .. | 750 | 275 1 | |
| 11th October, 1902 .. .. | 690 | 250 5 | |
| 20th October, 1902 .. .. | 730 | 211 5 | |
| 3rd November, 1902 .. .. | 760 | 262 0 | |
| 17th November, 1902 .. .. | 705 | 200 5 | |
| 15th December, 1902 .. .. | 670 | 251 10 | |
| 12th January, 1903 .. .. | 504 | 214 12 | |
| 26th January, 1903 .. .. | 720 | 249 0 | |
| 9th February, 1903 .. .. | 720 | 274 15 | |
| 23rd February, 1903 .. .. | 680 | 246 0 | |
| 9th March, 1903 .. .. .. | 742 | 251 12 | |
| 23rd March, 1903 .. .. | 760 | 241 10 | |
| 6th April, 1903 .. .. .. | 750 | 240 0 | |
| 20th April, 1903 .. .. .. | 730 | 220 0 | |
| 4th May, 1903 .. .. .. | 780 | 247 10 | |
| 18th May, 1903 .. .. .. | 740 | 251 10 | |
| 1st June, 1903 .. .. .. | 735 | 250 10 | |
| 15th June, 1903 .. .. .. | 730 | 241 0 | |
| 1st July, 1903 .. .. .. | 732 | 246 12 | |
| 27th July, 1903 .. .. .. | 705 | 170 0 | |
| 10th August, 1903 .. .. | 704 | 155 17 | |
| 24th August, 1903 .. .. | 720 | 251 0 | |
| 19th October, 1903 .. .. | 720 | 182 0 | |
| 2nd November, 1903 .. .. | 700 | 151 0 | |
| 30th November, 1903 .. .. | 1,300 | 366 17 | |
| 14th December, 1903 .. .. | 1,300 | 307 15 | |
| 30th December, 1903 .. .. | 1,420 | 325 0 | |
| 11th January, 1904 .. .. | 638 | 163 2 | |
| 27th January, 1904 .. .. | 1,400 | 316 0 | |
| 8th February, 1904 .. .. | 1,550 | 400 0 | |
| 24th February, 1904 .. .. | 1,510 | 410 17 | |
| 7th March, 1904 .. .. .. | 1,590 | 397 0 | |
| 23rd May, 1904 .. .. .. | 1,591 | 400 0 | |
| 31st March, 1904 .. .. | 1,700 | 730 14 | |
| 18th April, 1904 .. .. .. | 1,460 | 369 5 | |
| 2nd May, 1904 .. .. .. | 1,600 | 393 0 | |
| 16th May, 1904 .. .. .. | 1,558 | 424 10 | |
| 13th June, 1904 .. .. .. | 1,640 | 411 5 | |

YIELD—*continued.*

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| *Maryborough Leviathan Gold Mines Ltd.*—continued. | | | |
| 27th June, 1904 .. .. .. | 1,675 | 420 10 | |
| 4th July, 1904 .. .. .. | 13,571 | 5,046 8 | |
| 11th July, 1904 .. .. .. | 1,623 | 410 0 | |
| 27th July, 1904 .. .. .. | 1,541 | 380 0 | |
| 5th September, 1904 .. .. | 3,118 | 741 5 | |
| 13th October, 1904 .. .. | 3,285 | 716 10 | |
| 31st October, 1904 .. .. | 3,318 | 618 6 | |
| 28th November, 1904 .. .. | 2,215 | 511 0 | |
| 12th June; 1905 .. .. .. | 2,105 | 496 0 | |
| 23rd January, 1905 .. .. | 1,677 | 419 0 | |
| 20th February, 1905 .. .. | 2,099 | 441 10 | |
| 24th March, 1905 .. .. | 2,155 | 558 0 | |
| 17th April, 1905 .. .. .. | 1,941 | 513 0 | |
| 15th May, 1905 .. .. .. | 2,190 | 487 0 | |
| 12th June, 1905 .. .. .. | 2,105 | 496 0 | |
| 10th July, 1905 .. .. .. | 2,337 | 391 0 | |
| 7th August, 1905 .. .. | 2,064 | 394 6 | |
| 4th September, 1905 .. .. | 1,966 | 427 0 | |
| 1906 .. .. .. .. | 200 | 20 0 | New reef at 960-ft. level |

### 3. OLD LEVIATHAN REEF.

This reef is situated at Chinamen's Flat, close to the main Timor road, and 2 miles north of Maryborough.

It is in the Western Dyke Belt, and is accompanied by a dyke 6 feet wide which can be seen at the surface just south of the main workings, and can be traced as far north as the Chow Chow North Mine. (See p. 62.)

The strike of the reef workings is N. 15° W. There are three reefs, the Western, small and poor; the Main Reef, 50 feet further east; and the Eastern Reef, 60 feet still further east. The last-mentioned reef dips west and joins with the big Main Reef at about 120 feet deep, where the quartz was from 25 feet to 30 feet in width.

The Western and Main Reefs dip east, and it is on the big Main Reef that most of the work was done.

The work in the early sixties was done from ten claims as follows:—

No. 1 ———.
Nos. 2 and 3. Williams and party.
No. 4. Finch and party.
No. 5. Reeves and party.
No. 6. Parks and party.
Nos. 7 and 8. Wardley and Cranston (big block, highly payable).
Nos. 9 and 10. Lester and party, or Frenchman's Claim.

From the appended yields, it will be seen that some of these claims were rich. No. 7 claim worked a big block of quartz on the Main Reef, which yielded 1¼ ozs. per ton; it was worked for a width of over 20 feet, and gave such dividends as £28 per man per week for some time, the best yield being 185 tons for 224½ ozs. in 1864. The workings, which were 54 feet deep in No. 5 claim, and 150 feet deep in No. 9 claim, show that the shoot pitched north. In No. 9 claim, the quartz formation was 30 feet wide and yielded 5 dwts. per ton. In 1867 a company worked it with profitable results, the work being from a main engine shaft 200 feet deep, which was sunk just north of No. 10 claim.

Yields from the Old Leviathan claims collected from the *Advertiser* records:—

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 21st March, 1862 .. .. | 30 | 16 10 | No. 2 Williams' Claim |
| 17th May, 1865 .. .. .. | 300 | 182 10 | ,, ,, |
| 25th March, 1865 .. .. | 30 | 5 13 | ,, ,, |
| 22nd July, 1867 .. .. .. | 90 | 22 10 | ,, ,, |
| 5th August, 1867 .. .. | 51 | 11 13 | ,, ,, |
| 12th August, 1867 .. .. | 34 | 7 10 | ,, ,, |
| 2nd September, 1867 .. .. | 27 | 7 7 | ,, ,, |
| 4th November, 1867 .. .. | 40 | 4 0 | ,, ,, |
| 13th June, 1862 .. .. .. | .. | 240 0 | No. 4 Brown and Finch's Claim |
| 4th May, 1864 .. .. .. | 277 | 118 0 | ,, ,, ,, |
| 3rd October, 1864 .. .. | 178 | 63 0 | ,, ,, ,, |
| 14th November, 1864 .. .. | .. | 41 6 | ,, ,, ,, |
| 25th October, 1865 .. .. | 29 | 26 9 | ,, ,, ,, |
| 25th March, 1867 .. .. | 100 | 37 12 | ,, ,, ,, |
| 29th April, 1867 .. .. .. | 53 | 15 0 | ,, ,, ,, |
| 29th April, 1867 .. .. .. | 20 | 3 0 | ,, ,, ,, |
| 11th September, 1867 .. .. | 60 | 17 7 | ,, ,, ,, |
| 19th September, 1867 .. .. | 170 | 23 0 | ,, ,, ,, |
| 29th March, 1869 .. .. | 97 | 25 15 | ,, ,, ,, |
| 29th March, 1869 .. .. | 64 | 8 0 | ,, ,, ,, |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Yield. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| 27th October, 1862 .. .. | 160 | 72 | 0 | No. 5 Reeves' Claim |
| 20th July, 1863 .. .. .. | .. | 127 | 0 | ,, ,, |
| 13th February, 1865 .. .. | 104 | 92 | 0 | ,, ,, |
| 11th September, 1865 .. .. | 70 | 21 | 0 | ,, ,, |
| 21st January, 1867 .. .. | 72 | 21 | 0 | ,, ,, |
| 1st April, 1867 .. .. .. | 104 | 28 | 6 | ,, ,, |
| 2nd September, 1867 .. .. | 104 | 18 | 5 | ,, ,, |
| 4th November, 1867 .. .. | 20 | 5 | 10 | ,, ,, |
| 1st October, 1862 .. .. | 131 | 90 | 0 | No. 6 Park's Claim |
| 27th July, 1863 .. .. .. | 360 | 100 | 0 | ,, ,, |
| 11th May, 1864 .. .. .. | 148 | 142 | 0 | ,, ,, |
| 24th June, 1864 .. .. .. | 300 | 210 | 0 | ,, ,, |
| 16th September, 1864 .. .. | 288 | 178 | 8 | ,, ,, |
| 2nd November, 1864 .. .. | 262 | 181 | 0 | ,, ,, |
| 1st November, 1865 .. .. | 352 | 83 | 8 | ,, ,, |
| 27th December, 1865 .. .. | 209 | 76 | 10 | ,, ,, |
| 4th June, 1866 .. .. .. | 115 | 40 | 5 | ,, ,, |
| 21st January, 1867 .. .. | 150 | 105 | 0 | ,, ,, |
| 21st January, 1867 .. .. | 150 | 33 | 15 | ,, ,, |
| 28th September, 1867 .. .. | 200 | 50 | 0 | ,, ,, |
| 12th April, 1869 .. .. .. | 244 | 59 | 0 | ,, ,, |
| 21st April, 1869 .. .. .. | 90 | 30 | 18 | ,, ,, |
| 24th March, 1862 .. .. | 30 | 16 | 10 | No. 7, Wardley and Cranston's Claim |
| 3rd September, 1862 .. .. | .. | 42 | 0 | ,, ,, ,, ,, |
| 27th October, 1862 .. .. | 200 | 80 | 0 | ,, ,, ,, ,, |
| 16th May, 1864 .. .. .. | 185 | 224 | 13 | ,, ,, ,, ,, |
| 29th June, 1864 .. .. .. | 180 | 160 | 15 | ,, ,, ,, ,, |
| 5th September, 1864 .. .. | 226 | 243 | 0 | ,, ,, ,, ,, |
| 24th October, 1864 .. .. | 161 | 104 | 0 | ,, ,, ,, ,, |
| 10th April, 1865 .. .. .. | 280 | 182 | 0 | ,, ,, ,, ,, |
| 16th June, 1865 .. .. .. | 400 | 416 | 0 | ,, ,, ,, ,, |
| 25th September, 1865 .. .. | 337 | 157 | 0 | ,, ,, ,, ,, |
| 11th July, 1866 .. .. .. | 60 | 30 | 0 | ,, ,, ,, ,, |
| 24th August, 1866 .. .. | 108 | 48 | 0 | ,, ,, ,, ,, |
| 15th April, 1867 .. .. .. | 322 | 104 | 0 | ,, ,, ,, ,, |
| 20th May, 1867 .. .. .. | 150 | 51 | 0 | ,, ,, ,, ,, |
| 24th June, 1867 .. .. .. | 82 | 39 | 0 | ,, ,, ,, ,, |
| 5th August, 1867 .. .. | 151 | 30 | 0 | ,, ,, ,, ,, |
| 2nd September, 1867 .. .. | 175 | 94 | 0 | ,, ,, ,, ,, |
| 4th July, 1864 .. .. .. | 190 | 101 | 0 | Nos. 8 and 9, Taylor and Lester |
| 23rd September, 1864 .. .. | 281 | 246 | 0 | ,, ,, ,, |
| 31st March, 1865 .. .. | 247 | 148 | 0 | ,, ,, ,, |
| 2nd June, 1865 .. .. .. | 400 | 100 | 0 | ,, ,, ,, |
| 1st September, 1865 .. .. | 119 | 70 | 0 | ,, ,, ,, |
| 4th July, 1866 .. .. .. | 233 | 115 | 10 | ,, ,, ,, |
| 11th September, 1867 .. .. | 107 | 28 | 3 | ,, ,, ,, |
| 23rd September, 1867 .. .. | 175 | 59 | 2 | ,, ,, ,, |
| 7th May, 1866 .. .. .. | 250 | 75 | 0 | Fisher and party |
| 18th June, 1866 .. .. .. | 160 | 99 | 0 | ,, ,, |
| 4th November, 1867 .. .. | 370 | 56 | 10 | Leviathan Co. (Old) |
| 7th October, 1867 .. .. | 20 | 2 | 0 | South Old Leviathan Co. |
| 14th October, 1867 .. .. | 17 | 8 | 10 | ,, ,, |
| 2nd December, 1867 .. .. | 380 | 56 | 0 | Old Leviathan Co. |
| 9th December, 1867 .. .. | 23 | 10 | 1½ | South Old Leviathan Co. |
| 21st September, 1868 .. .. | 150 | 40 | 0 | Clancy's tribute |
| 5th October, 1868 .. .. | 132 | 35 | 12 | ,, |
| 28th September, 1868 .. .. | 280 | 80 | 0 | Scholer and party |
| 23rd May, 1862 .. .. .. | 800 | 564 | 0 | No. of Claim not given |
| 18th January, 1865 .. .. | 262 | 285 | 0 | ,, ,, |
| 27th February, 1865 .. .. | 290 | 380 | 0 | ,, ,, |
| 29th October, 1866 .. .. | 75 | 30 | 0 | ,, ,, |
| 31st March, 1869 .. .. | 345 | 88 | 8 | ,, ,, |
| 23rd September, 1878 .. .. | 36 | 28 | 16 | Old Leviathan, Wardley |
| 11th August, 1879 .. .. | 16 | 5 | 0 | ,, ,, |
| 19th September, 1879 .. .. | 100 | 27 | 5 | ,, ,, |
| 16th November, 1879 .. .. | 100 | 40 | 0 | ,, ,, |
| 30th September, 1879 .. .. | 352 | 220 | 10 | From 70 feet to 80 feet deep |

### 4. GREAT LEVIATHAN REEF.

The Great Leviathan Reef is situated in the Western Dyke Belt and on the southern extension of the Cymbeline lease. It is on the Old Leviathan line of reef, about 30 chains to the south of the main workings on that line.

In the early days it was payable near the surface, but when worked in the nineties by the Great Leviathan Co., no dividends were paid.

The main shaft is reported to be 120 feet deep, and the bottom level showed the reef formation to be very broken. In the workings between the 100 ft. level and the surface, the reef formation has been stoped for a length of 300 feet in places, mostly north of the main shaft.

The reef formation, which strikes about N. 22° W., was very mullocky, but at times contained a air percentage of quartz spurs which were stoped for a width of over 3 feet.

Yields up to 14 dwts. per ton were obtained in 1892, but the last crushings gave only 4 dwts. per ton, which was not payable on account of the broken nature of the formation.

The following yields are from the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Yield. |
|---|---|---|
| | Tons. | ozs. dwts. |
| 31st December, 1892 .. | 170 | 118 19 |
| 13th February, 1893 .. | 70 | 48 10 |
| 13th March, 1893 .. | 69 | 24 4 |
| 24th April, 1893 .. | 80 | 30 0 |
| 22nd May, 1893 .. | 59 | 26 10 |
| 23rd December, 1895 .. | 9 | 4 3 |
| 30th March, 1896 .. | 54 | 23 6 |
| 30th June, 1896 .. | 280 | 143 1 |
| 19th October, 1896 .. | .. | 44 10 |
| November, 1896 .. | .. | 78 16 |

### 5. Mariner's Reef.

Immediately to the south of the Maryborough township boundary, and associated with the Soldier's Hill lines of reef, is the well-known Mariner's Reef. (Plate IV.) This reef is in the Western Dyke Belt and is directly associated with a lamprophyre dyke. (Fig. 13.)

It was one of the first reefs to be exploited in the district, and in the sixties kept a 44-head battery constantly at work, but the very early records are incomplete

The main workings extend over 1,000 feet north and south along a reef which was apparently a large low-grade quartz formation. A smaller and very rich reef, known as the Little Reef, occupies the northern continuation of the same reef channel, which strikes N. 12° W., and dips 85° westward. The small rich reef averages 12 inches wide and makes to 2 feet wide.

The underground workings are now open and show that water level was about 200 feet from the surface. At a depth of about 400 feet the reef passes between a syncline and an anticline; and at the 528 foot and 628 foot levels the reef cuts across the country, dipping 85° westward while the beds dipped 70° to the east.

At the time of the completion of the field work for the Geological Quarter Sheet in 1907, the mine was at work. The main shaft had just been cleaned out to 628 feet and extended, making the total depth to the bottom of the well 800 feet in all.

The old company put in crosscuts east and west at 60 feet, but these were inaccessible at the time of my inspection.

At the 346-ft. level a crosscut was driven E. for 240 feet, exposing quartz tracks at 28 feet, 59 feet, and 138 feet, a run of pug at 237 feet, and a fault dipping 60° to the east close to the shaft. The beds dip 75° to the west almost to the end of the old company's workings, but on the extension of the crosscut by the present company an anticlinal fold was passed through and then the beds dip east to the end, 400 feet.

Short crosscuts were put out E. by the old company at depths of 401 feet, 426 feet, and 452 feet to the reef, which lay close to the east side of the shaft.

At 528 feet the reef was in the shaft, and drives have been extended 149 feet north and 247 feet south, exposing a horizontal dyke offshoot, which cut the reef and which forms the roof of the drive from end to end: it has a slight pitch south-east, and is 4 feet thick in places. (Fig. 14.) This flat dyke has its origin from a main vertical dyke which shows in the end of the west crosscut at the 628-ft. level. (Figure 13.)

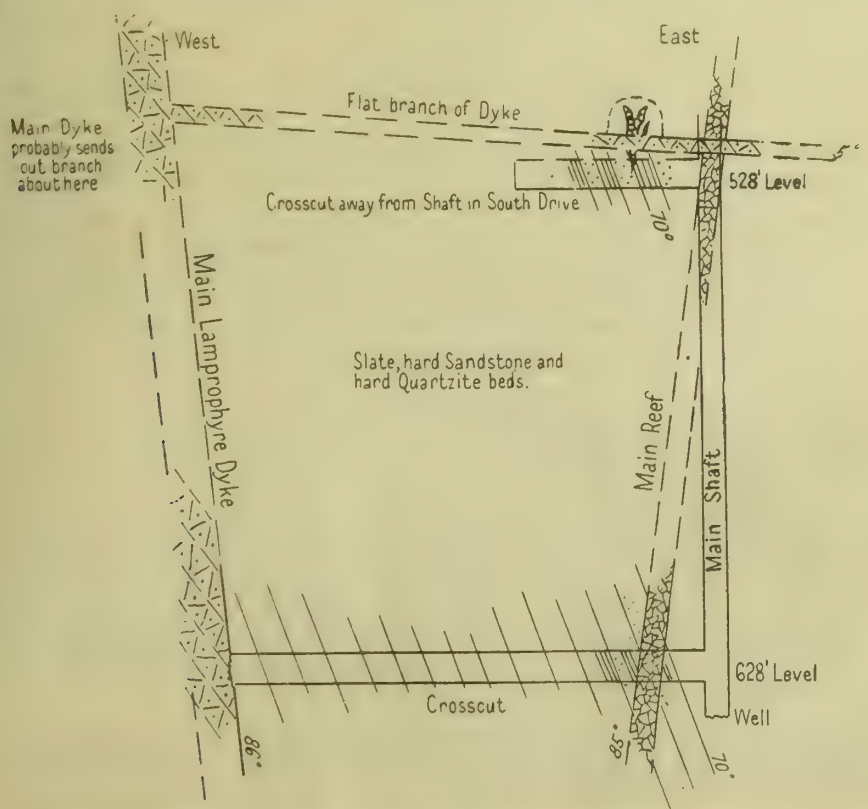



Fig. 13. Transverse Section, Mariner's Reef, showing main dyke and lateral offshoot. Scale 40 feet to 1 inch.

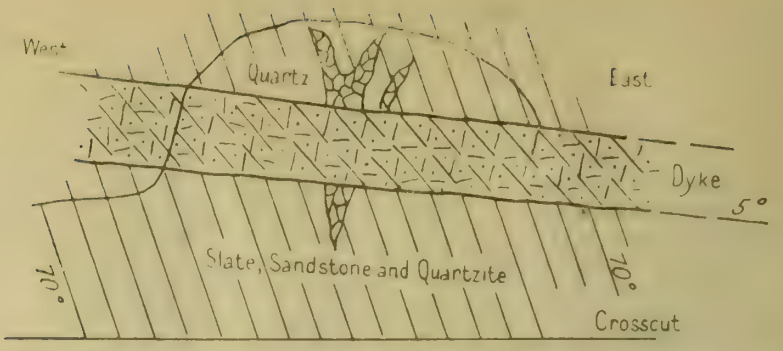



Fig. 14. Horizontal dyke offshoot, Mariner's reef, 528 feet level. Scale 10 feet to 1 inch.

The dyke has been determined as a lamprophyre.

If the main dyke and reef keep their present dip towards one another they will meet just about 1,000 feet from the surface, and about 60 feet or so to the west of the shaft, and there will then possibly be an enrichment in the reef. An assay of the decomposed dyke (No. 633) gave a trace of gold, which is interesting because the specimen was wholly in the dyke channel and away from quartz.

At this level there is a few inches of quartz carrying 10 dwts. gold per ton. This is apparently the pinched north end of the rich shoot. (Fig. 15.) At the south end of the rich shoot there is 2 feet of quartz, with fair prospects of gold. At the extreme south of the level a 90-ft. rise connects with the old south workings.

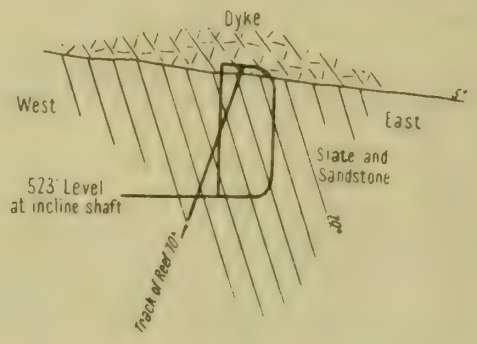



Fig. 15. Dyke cutting reef and strata, north face, 528-ft. level, Mariner's Reef. Scale 10 feet to 1 inch.

At the 628-ft. level the reef was cut just west of the shaft, and drives were extended 272 feet north and 75 feet south, with crosscuts of 100 feet west opposite the shaft and 20 feet at the north end of the level.

Prospects at this level may be stated as follows :—

The South drive (75 feet) exposes a large reef 8 feet wide, proved to carry 3 dwts. of gold per ton.

The Incline Workings.—The north drive is along a big reef from 3 feet up to 7 feet in width, carrying gold to the extent of 5 dwts. up to 1 oz. per ton where stoped.

North end.—About 184 feet north of the shaft, the rich shoot was stoped to within 10 feet of the level, having made into a big spurry reef several feet thick, as recorded in the last half-yearly report of the Old Company (1883). At the extreme north end the reef is only 6 inches wide, and has been underhand stoped to a depth of 15 feet by 30 feet long for a yield of 6 dwts. per ton. From the north end a crosscut 20 feet west cut large flat spurs of quartz and a 5-ton trial crushing of these yielded 3 dwts. per ton.

The 628-ft. level crosscut was extended past the reef, and cut several small western spurs in eastern beds and at 89 feet a small well-defined track of quartz, finally meeting the main dyke at 100 feet from the shaft where crosscutting was discontinued.

Besides extending the eastern crosscut at the 346-ft. level, the present company has sunk the main shaft, and is now opening out at 775 feet on the reef channel which was cut 39 feet west of the shaft.

Early records show that the pyrites yielded 3 ozs. to 4 ozs. of gold per ton of concentrates, and, moreover, in recent years the Old Mariner's tailings have been profitably cyanided. With modern improvements in mining and ore treatment, and considering the large low grade quartz bodies in the lower levels, it may be said that Mariner's Reef is well worthy of further development at deeper levels, for which purpose the present company was formed and the shaft was sunk.

The present company hold lease No. 5486, which is 49 acres 2 roods 29 perches in area, and in addition to the Mariner's Reef, includes Mariner's North, Gympie, Cole's and Soldier's Hill lines of reef, all of which will be dealt with separately. (Plate IV.)

The appended yields are taken from the *Maryborough Advertiser*, but before giving the full list, a few aggregate rich yields will be stated :—

From the beginning of mining operations to the end of 1868, the Mining Surveyor reports 3,340 tons for 33,400 ozs.

Incline shaft, 16th March, 1883 to 31st October, 1883—581 tons for 333 ozs. (under the rich shoot).

No. 1 Claim, 18th January, 1861, to 18th July, 1862—474 tons for 1,591 ozs.

No 2 Claim, 17th June, 1861, to 17th January, 1862—457 tons for 801 ozs.

And in one claim, report states a parcel went 60 ozs. per ton, but no tonnage is given.

*Mariner's Reef Yields.*

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Total. | ozs. dwts. | |
| | | *No. 1 Claim.* | |
| 18th January, 1861 .. .. | 11 | 38 10 | No. 1 Claim, Taylor |
| 17th July, 1861 .. .. | 57 | 413 0 (amal.) | ,, ,, |
| 28th October, 1861 .. .. | 45 | 172 0 | .. .. |
| 2nd December, 1861 .. .. | 95 | 69 0 | ,, ,, (mullock) |
| 10th October, 1862 .. .. | 100 | 543 0 (amal.) | ,, ,, |
| 27th November, 1865 .. .. | .. | 25 0 | ,, ,, (quantity of mullock) |
| 19th April, 1869 .. .. | 107 | 28 0 | ,, ,, |
| 18th July, 1862 .. .. | 59 | 302 18 | ,, ,, 550 feet deep |
| | | *No. 2 Claim.* | |
| 17th June, 1861 .. .. | 38 | 118 0 | No. 2 Claim, 410 feet deep |
| 10th July, 1861 .. .. | 14 | 100 0 | ,, ,, |
| 16th August, 1861 .. .. | 80 | 215 0 | ,, ,, |
| 30th September, 1861 .. .. | 90 | 232 0 | ,, ,, |
| 2nd December, 1861 .. .. | 92 | 68 13 | ,, ,, |
| 17th January, 1862 .. .. | 43 | 63 0 | ,, ,, |
| 8th August, 1866 .. .. | 100 | 5 0 | ,, ,, (mullock) |
| | | *Nos. 3 and 4 Claims.* | |
| 2nd August, 1861 .. .. | 55½ | 232 1 | Nos. 3 and 4 Claims, 380 feet deep |
| | | *Nos. 5 and 6 Claims.* | |
| 17th January, 1862 .. .. | 19 | 20 0 | No. 5 and No. 6 Claim |
| | | *No. 7 Claim.* | |
| 25th June, 1862 .. .. | .. | 64 0 | No. 7 Claim (mullock crushing) |
| 19th September, 1862 .. .. | 114 | 57 10 | ,, |
| | | *No. 10 Claim.* | |
| 20th August, 1862 .. .. | 89 | 14 5 | No. 10 Claim, Kloper's |
| | | *Mariner's Reef.* | |
| 4th December, 1865 .. .. | .. | 14 0 | Mullock |
| 19th January, 1866 .. .. | 705 | 41 15 | ,, |
| 3rd August, 1866 .. .. | 40 | 5 13 | ,, |
| 8th February, 1867 .. .. | 320 | 35 0 | ,, |
| 20th February, 1867 .. .. | .. | 56 10 | ,, |
| 21st September, 1867 .. .. | 1 | 4 0 | ,, |
| 31st October, 1866 .. .. | 13 | 10 15 | Tribute |
| 12th November, 1866 .. .. | 30 | 251 15 | 2 feet wide, 600 feet deep |
| December, 1866.. .. .. | 109 | 209 0 | 600 feet deep |
| 29th April, 1867 .. .. | 45 | 327 0 | ,, |
| August, 1867 .. .. .. | 256 | 49 6 | Mainly mullock |
| 14th October, 1867 .. .. | 68 | 110 0 | |
| 11th November, 1867 .. .. | 790 | 195 0 | |
| December, 1867.. .. .. | 784 | 154 0 | |
| 17th February, 1868 .. .. | 410 | 89 0 | |
| 18th March, 1868 .. .. | 532 | 86 14 | |
| 3rd May, 1869 .. .. .. | 70 | 27 0 | 628 feet level (No. 1 Tribute) |
| 27th January, 1873 .. .. | .. | .. | Pyrites worth £12 per ton |
| 5th December, 1873 .. .. | 170 | 10 11 | Sand tribute, one month |
| 11th September, 1874 .. .. | 250 | 161 10 | Quarterly return |
| 10th April, 1878 .. .. | 500 | 100 0 | Quarterly returns. Battery |
| 10th April, 1878 .. .. | 2,388 | 1,658 3 | ,, ,, Battery |
| 10th April, 1878 .. .. | 1,000 | 100 2 | ,, ,, Tailings |
| 8th July, 1878 .. .. .. | 358 | 87 10 | |
| 4th October, 1878 .. .. | 126 | 25 4 | |
| 6th March, 1882 .. .. | 150 | 185 6 | |
| 3rd May, 1882 .. .. .. | 226 | 20 5 | |
| 3rd May, 1882 .. .. .. | 68 | 19 10 | |
| | | *Mariner's Tree Shaft.* | |
| 14th June, 1882 .. .. | 110 | 13 0 | Near where gold was first found |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | *Mariner's Reef and Soldier's Hill.* | | |
| 30th December, 1881 .. .. | 1,452 | 251 1 | Quarterly return |
| 31st March, 1882 .. .. | 230 | 189 11 | ,, |
| 30th June, 1882 .. .. | 1,661 | 504 17 | ,, 300-ft. level, Mariner's |
| 25th August, 1882 .. .. | 2,897 | 627 4 | ,, |
| 25th August, 1882 .. .. | 1,696 | 197 4 | ,, |
| 31st March, 1883 .. .. | 964 | 227 5 | ,, |
| 30th June, 1883 .. .. | 554 | 168 15 | ,, |
| 30th September, 1883 .. .. | 324 | 109 4 | ,, |
| | *Incline Shaft or Blind Shaft, 528-ft. level to 600-ft. level.* | | |
| 16th March, 1883 .. .. | 39 | 45 0 | Amal. |
| 30th March, 1883 .. .. | 62 | 60 0 | ,, |
| 2nd May, 1883 .. .. | 33 | 10 0 | ,, |
| 13th June, 1883 .. .. | 64 | 24 0 | ,, |
| 27th June, 1883 .. .. | 47 | 36 0 | ,, |
| 27th June, 1883 .. .. | 60 | 28 7 | ,, |
| 25th July, 1883 .. .. | 57 | 17 0 | |
| 22nd August, 1883 .. .. | 63 | 67 0 | |
| 22nd August, 1883 .. .. | 52 | 40 0 | Amal. |
| 19th September, 1883 .. .. | 20 | 3 5 | |
| 3rd October, 1883 .. .. | 54 | 4 6 | |
| 31st October, 1883 .. .. | 30 | 3 7 | |
| | *Mariner's Tribute.* | | |
| 30th March, 1883 .. .. | 16 | 2 15 | |
| 18th April, 1883 .. .. | 70 | 10 13 | |
| 2nd May, 1883 .. .. .. | 42 | 10 0 | |
| 2nd May, 1883 .. .. .. | 26 | 2 12 | |
| 22nd August, 1883 .. .. | 18 | 1 3 | |
| 3rd October, 1883 .. .. | 61 | 5 0 | |
| 31st October, 1883 .. .. | 45 | 3 6 | |
| | *Mariner's Incline Shaft.* | | |
| 11th August, 1882 .. .. | 420 | 54 0 | |
| 25th August, 1882 .. .. | 150 | 10 15 | |
| 6th September, 1882 .. .. | 200 | 12 3 | |
| 18th October, 1882 .. .. | 134 | 23 10 | |
| 1st November, 1882 .. .. | 375 | 44 0 | |
| 30th March, 1883 .. .. | 112 | 39 0 | |
| 14th April, 1883 .. .. | 153 | 31 1 | |
| 2nd May, 1883 .. .. .. | 42 | 106 0 | Amal. S. Blind Shaft |
| 21st December, 1885 .. .. | 95 | 47 14 | |
| 30th December, 1885 .. .. | 137 | 159 0 | |
| | *Mariner's Reef—Rodger.* | | |
| 30th September, 1885 .. .. | 16 | 38 0 | |
| 1st February, 1886 .. .. | 111 | 49 0 | |
| 15th February, 1886 .. .. | 11½ | 6 10 | |
| | *Mariner's—Rodger and Bell.* | | |
| February, 1886 .. .. .. | 423 | 358 7 | |
| | *Mariner's—Lowenstein.* | | |
| 31st March, 1886 .. .. | 138 | 54 0 | 50 feet deep |
| | *Mariner's—New Reef.* | | |
| 19th August, 1895 .. .. | 13 | 7 4 | Name of party not given |
| 23rd September, 1895 .. .. | 54 | 64 6 | |
| 20th December, 1895 .. .. | 22 | 8 6 | |
| | *Mariner's—Glasson.* | | |
| 31st December, 1894 .. .. | .. | 21 0 | |
| 30th June, 1895 .. | 23 | 12 10 | |
| 30th September, 1895 .. .. | 23 | 17 18 | |
| 30th December, 1895 .. .. | 46 | 16 0 | |
| | *Mariner's—Rowles and Party.* | | |
| 28th October, 1895 .. .. | 8 | 3 9 | |
| 2nd December, 1895 .. .. | 10 | 6 16 | |
| 30th December, 1895 .. .. | 34 | 21 2 | |
| | *Mariner's—Hourigan.* | | |
| 30th December, 1895 .. .. | 54 | 15 13 | |
| | *Mariner's—Cruickshank.* | | |
| 8th April, 1896 .. .. | 18 | 8 14 | |
| 2nd November, 1896 .. .. | 18 | 10 11 | |
| | *Mariner's—Harris.* | | |
| 30th September, 1896 .. .. | 5 | 4 8 | |
| 22nd November, 1897 .. .. | 10 | 3 4 | |
| 31st December, 1897 .. .. | 47 | 22 13 | |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons | ozs. dwts. | |
| *Mariner's—Burg and Johnson.* | | | |
| 23rd June, 1902 .. .. | 7 | 6 9 | |
| *Phillips.* | | | |
| 22nd December, 1902 .. .. | 6 | 2 9 | |
| *Mariner's Reef.* | | | |
| 21st August, 1899 .. .. | 6 | 1 3 | Withers |
| 31st March, 1900 .. .. | 9 | 2 2 | ,, |
| *Mariner's Reef.* | | | |
| 23rd December, 1895 .. .. | 10 | 7 14 | |
| 30th December, 1895 .. .. | 162 | 134 1 | Quarterly record |
| 1895 .. .. .. .. | 284 | 190 15 | Annual record |
| 20th January, 1896 .. .. | 57 | 21 11 | |
| 3rd February, 1896 .. .. | 43 | 20 10 | |
| 21st February, 1896 .. .. | 56 | 12 4 | |
| 3rd April, 1896 .. .. | 36 | 38 0 | |
| 27th April, 1896 .. .. | 39 | 13 11 | |
| 25th May, 1896 .. .. | 69 | 32 0 | |
| 29th June, 1896 .. .. | 32 | 9 0 | |
| 14th September, 1896 .. .. | 28 | 7 1 | |
| 5th October, 1896 .. .. | 19 | 7 6 | |
| *Upper Levels, Mariner's and Soldier's Hill.* | | | |
| 8th April, 1895 .. .. .. | 36 | 15 0 | |
| 19th August, 1895 .. .. | 10 | 6 15 | |
| 30th September, 1895 .. .. | 48 | 17 15 | |
| 25th October, 1895 .. .. | 38 | 36 8 | |
| 25th November, 1895 .. .. | 62 | 72 7 | |
| *Mariner's Reef Co.* | | | |
| 30th March, 1896 .. .. | 191 | 64 0 | Quarterly record |
| 30th June, 1896 .. .. | 208 | 95 18 | ,, |
| *Mariner's Reef.* | | | |
| 22nd November, 1895 .. .. | 62 | 75 7 | Noell |
| 30th September, 1897 .. .. | 14 | 7 7 | ,, |
| 31st December, 1897 .. .. | 187 | 66 19 | ,, |
| *Mariner's Reef.* | | | |
| 19th December, 1897 .. .. | 17 | 11 4 | Taylor |
| *Mariner's Tribute.* | | | |
| 20th January, 1896 .. .. | 57 | 11 15 | |
| 10th September, 1897 .. .. | 14 | 7 7 | 84 feet level |
| 18th October, 1897 .. .. | 13 | 12 5 | |
| 12th November, 1897 .. .. | 45 | 22 17 | |

## 6. MARINER'S NORTH.

Mariner's North is on Williams' Hill, immediately north of Mariner's Main Reef workings, and on the other side of the railway line. (Pl. IV.) The country has the same structure and folding as at Mariner's.

Three lines of auriferous quartz channels have been worked—

(1) That furthest east is a large quartz vein dipping east at a low angle and crossing the beds which dip west. There is some manganese oxide along the outcrop.

(2) The next is a large reef formation full of quartz spurs, dipping west in beds which are vertical or dip east. This was the main line worked by Seebeck, Bowen and others, to a depth of about 70 feet, but the main whipshaft is deeper.

In places it shows 14 feet of spurs in the channel, but only portion of this was crushed, although the whole width gives prospects of fine gold. The strike of the workings is N. 12° W. Two small faults throw the reef to the west as it is followed northwards, Bowen's shaft being just opposite one of these.

There is some doubt as to whether a fault exists in Nuggetty Gully, since neither Mariner's rich line nor the other lines outcropping on Soldier's Hill have so far been definitely traced past it; the plan suggests that there is a fault which moved the reef west from Soldier's Hill to Williams' Hill; but it must be borne in mind, first, that no fault shows in the surface exposures, which are fairly good; secondly, that there is evidence of anticlinal and synclinal folds over 200 feet apart not having been displaced; and thirdly, that the lamprophyre dyke is in true line on both sides of Nuggetty Gully.

(3) The third line is a small laminated reef dipping 80° westwards in beds dipping 80° east, occurring close to the lamprophyre dyke, which, being here above water level, appears as a soft white to brown rock.

The following yields of Mariner's Extended and Mariner's North on Williams' Hill have been collected from the files of the *Maryborough Advertiser*, and show that yields up to 1½ oz. were obtained, and quantities of 4½ dwt. to 5 dwt. ore worked. With a battery at Mariner's these formations should be worth re-opening.

YIELDS.

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | | *Mariner's North.* | |
| 2nd September, 1870 .. .. | 150 | 223 0 | Seebeck |
| 10th October, 1870 .. .. | .. | 170 0 | |
| 21st November, 1870 .. .. | 290 | 60 0 | |
| 17th July, 1871 .. .. | 230 | 66 0 | Steel and Reeves |
| December, 1871.. .. .. | 963 | 501 9 | |
| 6th May, 1895 .. .. .. | 43 | 21 0 | |
| 13th June, 1895 .. .. | 40 | 9 18 | |
| 30th June, 1895 .. .. | 99 | 40 15 | |
| 8th July, 1895 .. .. .. | 20 | 5 1 | |
| 22nd July, 1895 .. .. | 9 | 1 13 | |
| 19th August, 1895 .. .. | 19 | 4 16 | Bowen |
| 28th October, 1895 .. .. | 44 | 11 10 | |
| 9th September, 1895 .. .. | 32 | 20 19 | |
| 28th October, 1895 .. .. | 44 | 11 10 | |
| 23rd December, 1895 .. .. | 28 | 10 9 | |
| 28th February, 1896 .. .. | 56 | 15 15 | Bowen |
| 30th March, 1896 .. .. | 123 | 21 2 | |
| 21st December, 1896 .. .. | 20 | 18 12 | |
| 29th January, 1897 .. .. | 39 | 15 9 | |
| 18th February, 1901 .. .. | 13 | 3 14 | |
| 31st March, 1901 .. .. | 51 | 13 10 | |
| 30th June, 1901 .. .. | 135 | 17 3 | Quarterly record |
| 12th August, 1901 .. .. | 60 | 11 9 | |
| 23rd September, 1901 .. .. | 68 | 11 16 | |
| 3rd February, 1902 .. .. | 22 | 2 7 | |
| 31st March, 1902 .. .. | 30 | 4 4 | |

## 7. SOLDIER'S HILL REEF.

Soldier's Hill Reef is just east of Cole's Reef, which lies between it and Mariner's Reef line. (Pl. IV.) It strikes N. 12° W., and dips 65° westward down to 110 feet deep.

The reef is spurry, and sometimes a wide body has been stoped out with payable returns. Amongst the reef formation there is often much kaolinised felspar, pointing to the proximity of a dyke. The horizontal offshoot of dyke rock coming from Mariner's probably accounts for the presence of the felspar.

The reef consists of from 1 foot or so up to 8 feet of laminated quartz, spurs of quartz, &c. The containing beds dip east on the eastern side of the Mariner's anticlinal fold.

Much pyrites is present in the beds, and cubes more than 1 inch across have been obtained both in the sandstone and the slate. Those pyrites cubes in green slate often show fine paint gold on their faces. No record of the value of concentrates is obtainable.

A great amount of work was done in the earlier years of mining on this line, leaving large open cuts along the surface on Soldier's Hill.

At the 110-ft. level the reef was near the shaft and a certain amount of work has been done, mostly north, where there was a payable shoot about 40 feet in length.

In recent years Hawkes and Roxburgh have been working this line from time to time at a depth of 170 feet, opening up a wide formation of quartz spurs, kaolin, slate, &c., from which they have had payable yields, the return in 1907 being 154 tons for 49 oz. 1 dwt., or nearly 6½ dwts. per ton. No work has been done on this line below water level. A few yields are given from the *Maryborough Advertiser* and other sources—

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 1863 .. .. .. .. | 168 | 88 15 | Reef, 3 feet wide |
| 4th February, 1865 .. .. | 110 | 12 14 | |
| 19th January, 1866 .. .. | 1,445 | 183 17 | Half-year's record |
| 3rd July, 1868 .. .. .. | 185 | 99 16 | |
| 10th August, 1868 .. .. | 176 | 36 0 | |
| 6th September, 1868 .. .. | 97 | 23 7 | |
| 26th October, 1868 .. .. | 261 | 57 11 | |
| 30th November, 1868 .. .. | 23 | 4 6 | Dow's claim |
| 30th November, 1868 .. .. | 89 | 8 3 | A prospector's lot |
| 26th November, 1868 .. .. | 1,100 | 165 0 | Crushed from the Soldier's Reef and the Battery Reef |
| 1896 .. .. .. .. | 731 | 383 0 | Yearly return |
| .. .. .. .. | 1,233 | 543 0 | Company's yield, supplied by Mr. Ivor Davies |
| 1907 .. .. .. .. | 154 | 49 1 | Reported in Annual Report |

A little further to the east, the Battery Reef has been worked extensively at the surface, and here good crushings were obtained, some as follows :—

| Date. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 14th October, 1867 .. .. | 627 | 99 0 | |
| 3rd July, 1868 .. .. .. | 459 | 45 16 | |
| August, 1868 .. .. .. | 348 | 62 0 | |
| November, 1868 .. .. | 190 | 47 2 | |
| 22nd December, 1873 .. .. | 2½ | 2 14 | Astbury and party |
| .. .. .. .. | 423 | 358 7 | Bell and party, crushed at Cambrian battery |

The Battery Reef is similar to the other Soldier's Hill lines, and dips to the west in eastern beds. The main workings were just at and south of the Old Mariner's Battery.

### 8. Cole's Reef Line.

Cole's Reef is situated on Soldier's Hill between Mariner's and Soldier's Reefs. (Pl. IV.) It strikes N. 12° west, and dips slightly westward, and is similar to Soldier's Reef.

It was worked for some distance along the surface to shallow depths, the reef varying from a few inches up to 2 feet wide, and was worked to water level at 220 feet. The shoot of payable stone pitched 45° to the north. The main shaft is 220 feet deep. Some of the aggregate yields recorded are—

543 tons for 776 ozs. 18 dwts. of gold .. Thompson and party.
453 tons for 338 ozs. 16 dwts. of gold .. Lange and party
Total of 996 tons for 1,114 ozs.

The average is well over 1 oz. per ton.

On the north end of Cole's line, and a little to the east of it, Peel and Hawkes have been working in recent years mainly on spurs associated with a bed of green slate. Their yield for the year 1907, as published in the Annual Report of Secretary for Mines, is given as 113 tons for 73 ozs., or 13 dwts. per ton.

Some workings on the north and to the west of Cole's were carried out at the Gympie Reef. Here a narrow 6-inch vein was worked and stoped out to 120 feet deep, a big body of poor quartz being on the eastern side of the small payable reef. Yields of ½ oz. up to 1 oz. are reported.

### 9. Blucher's Reef.

The workings are situated about half-a-mile south-east of the cemetery, and are the most important in the Eastern Dyke Belt. The reef, which was first opened in the fifties when rich returns were obtained in the south claims above water level, has been worked for some distance along the surface, and at one point to a depth of 786 feet in the main shaft.

The reef line crosses the beds and strikes due north and south on the average, and dips at an angle of 70° to the west, changing to 60° to the west below the 550-ft. level, and cutting beds dipping east. It is closely associated with a dyke.

Several shafts were sunk below water level (150 feet), as follows :—

The main shaft, 786 feet deep. (Size 10 ft. 6 in. by 4 feet.) Three compartments, in good order.
The German's south shaft, 210 feet south of main shaft. 352 feet deep.
The Spaniards' south shaft, 170 feet south of German's. Sunk 268 feet.
The Hambilton's shaft, 74 feet south of Spaniards. Sunk 250 feet.
The Williams' shaft, 175 feet north of main shaft. Sunk 426 feet.
Spaniards' north shaft, 608 feet north of Williams'. Sunk on north block 220 feet.

The stoped ground is approximately as follows :—

Main stopes 800 feet long by 230 feet opposite Hambilton's to 450 feet opposite Williams' shaft, and on a block pitching north. Then along the 450 ft. level for about 500 feet in length by 70 feet high, through the block worked by Body, Green, and the Nos. 1, 2, 3, and 4 tribute parties, the gold being more confined to certain shoots at the 450 ft. level than at the surface workings.

In the main workings, at the 550 foot level, a break in the reef was met at a distance of 860 feet north of the main shaft, and just below No. 1 tribute. The quartz runs from a few inches up to 3 feet in bulges, and averages about 22 inches in the main block.

In the 450-ft. level and about 380 feet north of the main shaft, Body and party worked their rich block, and Green and party worked at 640 feet north of the shaft. This level was extended to 920 feet north of the shaft and cut the break at 790 feet.

In 1895, several tribute parties worked, but only one or two met with success, on account of the narrowness of the stone at those particular places along the 550-ft. level.

The following are a few of the tribute yields for 1895, kindly supplied by Mr. J. P. Kennedy, of Maryborough. Nos. 1, 2, 3, 4, and 6, are at the 550-ft. level, and No. 5 at the 720-ft. level :—

| Date. | Tributes. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 1. | | No. 2. | | No. 3. | | No. 4. | | No. 5. | | No. 6. | |
| | Ore Treated. | Gold Yield. | Ore Treated. | Gold Yield. | Ore Treated. | Gold Yield. | Ore Treated. | Gold Yield. | Ore Treated. | Gold Yield. | Ore Treated. | Gold Yield. |
| 1895. | tons. | oz. dwt. | tons. | oz. dwt. | tons. | oz. dwt. | tons. | oz. dwt. | tons. | oz. dwt. | tons. | oz. dwt. |
| June .. | 48 | 13 14 | 45 | 12 13 | 27 | 3 5 | .. | .. | .. | .. | .. | .. |
| July .. | 41 | 43 18 | 39 | 11 9 | 45 | 20 18 | 6 | 5 16½ | 12 | 4 2 | 21 | 3 5 |
| August .. | 17 | 20 6 | 30 | 7 2 | 26 | 9 4 | 15 | 7 4 | Reef only 4 in.; too thin to pay. | | | |
| September .. | 42 | 30 12 | .. | .. | 46 | 19 3 | .. | .. | .. | .. | .. | .. |
| | 52 | 37 8 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 50 | 32 9 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| October .. | 3 | 2 18 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |

In July, 1895, some of the stone in these tributes was over 1 foot wide, with one bulge up to 3 feet but the average width was only a few inches. Though the lode was so narrow, the prospects in some of the tributes were encouraging, and the other side of the dyke might well have been prospected, because, when there are two reef channels separated by a dyke, in many instances only one will carry the thick stone.

720-ft. level.—At this level very little prospecting has been done, and only one small crushing of 2 tons yielding 2 ozs., was taken out from a short winze just to the north of the shaft. Here work was discontinued as the stone was only 4 inches wide and too narrow to pay. The main shaft was sunk to a depth of 786 feet as is recorded in the manager's last fortnightly report. (19th December, 1895.)

The main shaft is 360 feet to the west of the reef outcrop, and would cut the reef at a depth of about 800 feet if the dip remains unchanged. The crosscuts at the 450-ft. level being 210 feet east; at the 550-ft. level, 140 feet to the east; and at the 720-ft. level, 48 feet to the east.

*The Dyke and its relation to the Lode.*—As this reef is one of the most important in the Eastern Dyke Belt, a few additional notes on the dyke and its relation to the quartz reef will be useful, as they have hitherto not been noticed, although a peculiar regularity as to the footwall rock had been mentioned.

In 1889, Mr. R. A. F. Murray,* F.G.S., reporting on the Blucher's mine, stated that in the north drive at the 550-ft. level there was a jointed, dark-coloured sandstone, 6 feet wide, with quartz veins on both walls at different points along it. He also mentions that, although the reef at the 550-ft. level was cut sooner than expected, those working in the mine stated that the footwall country was similar in the upper levels.

Both of the above statements point to the existence of a dyke, and my own observations in the workings near the main shaft and at the north reef workings, show that there is a lamprophyre dyke along the line of reef and directly associated with the quartz blocks at the north end. (Fig. 16.)

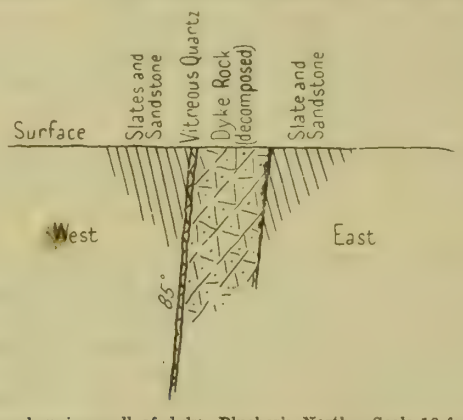



Fig. 16. Reef on hanging wall of dyke, Blucher's North. Scale 10 feet to 1 inch.

On the main mullock heaps, pieces of dyke rock are plentiful. Some from above the water level are greatly decomposed, soft, and yellow to brown in colour; others, from below water level, are dark-grey to black in colour, hard, and jointed. Some of the hard variety was shown to men who had worked in the deeper levels, and was recognised as the hard-jointed rock lying between the quartz reefs at the 550-ft. level.

Across Blucher's Gully, on the hill to the north opposite the main shaft, there is a decomposed lamprophyre dyke 4 feet in width, and carrying the usual reef block on its western or hanging wall. This indicates, at least for the north end of Blucher's Reef, that the quartz reefs are formed along the walls of the dyke in the fissures probably left when the dyke contracted on cooling. (Fig. 16.) The recognition of this structure should be an important guide in the future working of such lines of reef. At the bottom level, where 1-oz. stone was proved, but considered too narrow, it would, if on the dyke wall, have warranted further prospecting, as a bulge would be likely to occur at any moment.

*Quartz, Gold, and Pyrites.*—The quartz mined along Blucher's Reef is of a very favorable character, being laminated with dark mineralized seams, and containing galena in small patches where it is richest. Most of the gold is valued at £3 17s. 6d. per oz., and is finely divided. In the past much of the very fine gold was lost, as has been proved by the subsequent profitable cyaniding carried on at the old tailings heaps.

* Blucher's Reef, Maryborough. Repts. and Stat., Mines Department, Victoria. 30th September, 1891, p. 23.

Some of the old yields from the pyrites concentrates will give an idea of the value of the pyrites—

1877, Body's Block, 2¼ tons of pyrites yielded 12½ ozs. of gold.

1877, Body's Block, 3 tons of pyrites yielded 16½ ozs. of gold.

1878, ½ ton of pyrites yielded 3 ozs. 11 dwts. of gold.

There was about 1 ton of concentrates, worth about £24, to every 100 tons of quartz crushed, or 1 per cent.

On the hill above the main shaft there are two parallel reef lines known as the Specimen and Imperial Reefs, both a little to the west of Blucher's Reef.

The Specimen Reef was worked in the fifties, and yielded 1½ ozs. to the ton near the surface; good yields were also obtained to a depth of 150 feet, the stone carrying much galena and being up to 1 ft. 6 in. wide in places.

The Imperial was very rich, such yields as 36 lbs. of stone for 61½ ozs. being obtained near the surface in 1861, and in 1863 yields of 5 ozs. per ton. The width of this rich stone is not stated, and information generally is scarce. The enrichment was probably due to an indicator.

A few yields from the Specimen and Imperial Reefs will be given, following those of Blucher's Reef, which are now listed; they have been carefully collected from the files of the *Maryborough Advertiser*, dating from 1859 to 1896, and include the yields of the early claims such as Spaniards', Great Extended, Blucher's, and New Blucher's.

The average yield is about 12 dwts. per ton, but in the early claims it would be over 1 oz., including rich patches, such as in 1861, 40 lbs. for 28 ozs.; and 2 tons for 102 ozs. See below.

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | *Blucher's Reef Early Claims.* | | |
| 15th February, 1859 .. .. | 107 | 169 0 | |
| 30th September, 1859 .. .. | 27 | 54 0 | |
| 2nd January, 1860 .. .. | 50 | 30 0 | |
| 2nd January, 1860 .. .. | 240 | 300 0 | |
| 11th June, 1860 .. .. | 64 | 145 10 | |
| 22nd March, 1861 .. .. | .. | .. | |
| 31st May, 1861 .. .. | 2 | 102 0 | |
| 10th June, 1861 .. .. | 26 | 32 10 | Next to Whim Claim |
| 10th June, 1861 .. .. | 30 | 34 10 | Nos. 1 and 2 Spaniards |
| 7th June, 1861 .. .. | 24 | 91 0 | Nos. 3 and 4 Claims |
| 8th July, 1861 .. .. | 20 | 60 0 | No. 1 Claim |
| 8th July, 1861 .. .. | 28 | 27 6 | Claims south of Whim. Reef 2 feet thick |
| 15th July, 1861 .. .. | 50 | 48 5 | |
| 15th July, 1861 .. .. | 2 | 3 5 | |
| 26th July, 1861 .. .. | 130 | 208 0 | |
| 30th August, 1861 .. .. | 55 | 2 18 | |
| 11th September, 1861 .. .. | 113 | 9 9 | No. 2 Claim |
| 11th September, 1861 .. .. | 11 | 7 12 | No. 3 Claim |
| 23rd December, 1861 .. .. | 40 lbs. | 28 0 | Patch |
| 3rd February, 1862 .. .. | 157 | 196 3 | |
| 21st March, 1862 .. .. | 72 | 62 0 | |
| 14th April, 1862 .. .. | 23 | 59 16 | Spaniards' Claim |
| 24th July, 1863 .. .. | 155 | 131 0 | Spaniards' Claim, 18 inches of stone |
| 24th July, 1863 .. .. | .. | 0 12 | Stevens |
| 21st October, 1863 .. .. | 160 | 132 0 | No. 2 Claim |
| 2nd December, 1863 .. .. | 200 | 146 0 | Wilson |
| 6th January, 1864 .. .. | 137 | 126 0 | No. 1 South. Highly payable |
| 8th February, 1864 .. .. | 126 | 87 0 | Hambilton and party |
| 14th March, 1864 .. .. | 224 | 118 16 | Spaniards' No 3 South |
| 30th March, 1864 .. .. | 121 | 65 10 | Hambilton Claim |
| 4th May, 1864 .. .. .. | .. | 190 0 | German Claim |
| 36th November, 1864 .. .. | .. | 300 0 | Spaniards' Claim |
| 26th May, 1865 .. .. | 235 | 200 0 | German Claim |
| 17th November, 1865 .. .. | 118 | 85 0 | |
| 22nd November, 1865 .. .. | 143 | 126 0 | Kreete's Claim |
| 20th June, 1866 .. .. | 100 | 75 0 | |
| 30th July, 1866 .. .. | 124 | 93 0 | Kreete's Claim |
| 12th October, 1866 .. .. | 93 | 60 0 | ,, |
| 5th December, 1866 .. .. | 40 | 16 0 | Spaniards' Claim |
| 10th December, 1866 .. .. | 128 | 70 0 | ,, |
| 26th December, 1866 .. .. | 125 | 146 0 | Aguston's Claim |
| 11th February, 1867 .. .. | 61 | 38 0 | Kreete's Claim |
| 11th March, 1867 .. .. | 25 | 7 10 | |
| 1st April, 1867 .. .. | 105 | 63 0 | Manuel's Claim |
| 17th April, 1867 .. .. | 56 | 29 0 | |
| 19th April, 1867 .. .. | 110 | 200 0 | Burgdorp's Claim |
| 24th June, 1867 .. .. | 151 | 125 0 | Kreete's Claim |
| 2nd September, 1867 .. .. | 160 | 71 10 | Spaniards' Claim |
| 2nd September, 1867 .. .. | 10 | 2 10 | |
| 23rd September, 1867 .. .. | 67 | 24 17 | No. 1 North Claim |
| 2nd December, 1867 .. .. | 220 | 151 0 | Kreete's Claim |
| 23rd March, 1868 .. .. | 22 | 26 0 | Naby and Party |
| 25th May, 1868 .. .. | 44 | 34 0 | Rolby and Co. Claim |
| 15th June, 1868 .. .. | 17 | 30 0 | Gunther Claim |
| 9th November, 1868 .. .. | 92 | 91 14 | ,, |
| 5th February, 1869 .. .. | 30 | 30 0 | Williams' Claim |
| 1st March, 1869 .. .. | 170 | 68 0 | |
| 21st June, 1869 .. .. | 400 | 128 0 | Spaniards' Claim |
| 9th December, 1872 .. .. | 17 | 9 10 | |
| 24th March, 1873 .. .. | 7½ | 3 10 | Battle's Claim |
| 13th August, 1873 .. .. | 98 | 21 10 | Tribute |
| 13th August, 1873 .. .. | 30 | 18 10 | 360 feet level (Tribute). Trial lot |
| 22nd September, 1873 .. .. | 45 | 6 4 | Tribute |

YIELDS—*continued*.

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| | *Great Extended Co. (Blucher's).* | | | |
| 26th January, 1877 .. .. | 85 | 23 | 17 | |
| 19th March, 1877 .. .. | 200 | 40 | 0 | |
| 21st March, 1877 .. .. | 233 | 40 | 0 | |
| 27th June, 1877 .. .. | 80 | 45 | 0 | |
| 12th November, 1877 .. .. | 26 | 11 | 14 | 360 feet trial crushing |
| 10th December, 1877 .. .. | 32 | 36 | 0 | |
| 4th March, 1878 .. .. | 200 | 42 | 0 | |
| 4th March, 1878 .. .. | ½ | 3 | 1 | pyrites |
| 18th March, 1878 .. .. | 112 | 28 | 14 | |
| 10th April, 1878 .. .. | 309 | 74 | 13 | |
| 3rd May, 1878 .. .. .. | 90 | 45 | 11 | |
| | *United Body's Tribute, Blucher's Reef.* | | | |
| 16th July, 1877 .. .. | 110 | 22 | 10 | |
| 7th September, 1877 .. .. | 40 | 8 | 7 | |
| 24th September, 1877 .. .. | 60 | 17 | 0 | |
| 8th October, 1877 .. .. | 2¼ | 12 | 10 | Pyrites |
| 22nd October, 1877 .. .. | 3 | 16 | 10 | Pyrites |
| 17th December, 1877 .. .. | .. | 71 | 12 | Copper plates cleaned |
| | *Blucher's Great Extended Co. (Tribute).* | | | |
| 3rd February, 1879 .. .. | 334 | 79 | 10 | Hambilton and Ellis |
| 25th June, 1879 .. .. | 53½ | 93 | 0 | ,, |
| | *Blucher's Reef Line.* | | | |
| 15th August, 1881 .. .. | 13 | 5 | 9 | Turner |
| 26th September, 1881 .. .. | 7½ | 1 | 11 | ,, |
| 26th September, 1881 .. .. | 10 | 6 | 17 | Schlomer |
| 31st March, 1882 .. .. | 216 | 32 | 0 | Quarterly record |
| 30th June, 1882 .. .. | 43 | 67 | 19 | ,, ,, |
| 30th September, 1882 .. .. | 18½ | 12 | 13 | ,, |
| | *New Blucher's Company.* | | | |
| 25th May, 1892 .. .. | 16 | 15 | 11 | |
| 15th August, 1892 .. .. | 69 | 43 | 15 | |
| 5th September, 1892 .. .. | 46 | 47 | 12 | |
| 8th May, 1893 .. .. | 84½ | 25 | 12 | |
| 31st July, 1893 .. .. | 120 | 27 | 15 | |
| 14th August, 1893 .. .. | 120 | 35 | 15 | |
| 25th August, 1893 .. .. | .. | 38 | 18 | |
| 11th September, 1893 .. .. | 120 | 44 | 0 | Fortnight |
| 23rd October, 1893 .. .. | .. | 56 | 0 | ,, |
| 9th October, 1893 .. .. | .. | 48 | 12 | ,, |
| 23rd October, 1893 .. .. | 10 | 32 | 0 | Concentrates |
| 20th November, 1893 .. .. | .. | 47 | 0 | Fortnight |
| 4th December, 1893 .. .. | .. | 76 | 2 | ,, |
| 14th December, 1893 .. .. | .. | 52 | 12 | ,, |
| 21st December, 1893 .. .. | 1,197 | 412 | 6 | Quarterly return (Battery). Some included above |
| 15th January, 1894 .. .. | .. | 59 | 10 | 10½ days |
| 29th January, 1894 .. .. | .. | 44 | 10 | Fortnight |
| 12th February, 1894 .. .. | .. | 29 | 15 | Week |
| 13th March, 1894 .. .. | .. | 96 | 13 | Fortnight (plates included) |
| 16th April, 1894 .. .. | .. | 115 | 0 | Amalgam |
| 23rd April, 1894 .. .. | .. | 104 | 11 | |
| 30th April, 1894 .. .. | .. | 110 | 0 | Amalgam |
| 7th May, 1894 .. .. | .. | 84 | 0 | |
| 14th May, 1894 .. .. | .. | 152 | 0 | Amalgam |
| 21st May, 1894 .. .. | .. | 109 | 0 | Fortnight |
| 4th June, 1894 .. .. | .. | 144 | 0 | 9 days |
| 18th June, 1894 .. .. | .. | 77 | 0 | Fortnight |
| 2nd July, 1894 .. .. | .. | 63 | 15 | ,, |
| 16th July, 1894 .. .. | .. | 67 | 2 | ,, |
| 30th July, 1894 .. .. | .. | 50 | 5 | |
| 28th August, 1894 .. .. | .. | 61 | 6 | |
| 24th September, 1894 .. .. | .. | 54 | 15 | |
| 31st September, 1894 .. .. | .. | 98 | 16 | Balance yearly return |
| 8th October, 1894 .. .. | .. | 49 | 15 | |
| 5th November, 1894 .. .. | .. | 92 | 0 | Fortnight |
| 31st December, 1894 .. .. | .. | 15 | 15 | Balance quarterly return |
| 30th June, 1895 .. .. | 208 | 93 | 0 | Half-year record |
| 30th September, 1895 .. .. | 699 | 341 | 1 | Quarterly record |
| | *New Blucher's Co. (Tribute).* | | | |
| 27th May, 1895 .. .. | 56 | 36 | 0 | |
| 17th June, 1895 .. .. | .. | 30 | 0 | |
| 8th July, 1895 .. .. | 102 | 47 | 14 | |
| 22nd July, 1895 .. .. | 98 | 52 | 0 | |
| 19th August, 1895 .. .. | 90 | 40 | 0 | |
| 2nd September, 1895 .. .. | 68 | 25 | 0 | |
| 16th September, 1895 .. .. | .. | 45 | 16 | Fortnight |
| 30th September, 1895 .. .. | 50 | 32 | 10 | ,, |
| 28th October, 1895 .. .. | 46 | 18 | 0 | |
| 11th November, 1895 .. .. | | 94 | 0 | Fortnight |
| 25th November, 1895 .. .. | | 10 | 10 | |
| 23rd December, 1895 .. .. | | 4 | 7 | |

YIELDS—*continued*.

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| *Specimen Reef Yields.* | | | |
| 11th June, 1859 .. .. | Going 1 oz. to ton | | |
| 12th October, 1859 . .. .. | 3½ | 3 13 | 40 feet deep; width, over 1 ft. 6 in. Adamini's Claim |
| 16th November, 1859 .. .. | 3 | 5 0 | |
| 24th February, 1860 .. .. | 17 | 17 0 | |
| 22nd March, 1861 .. .. | 17 | 32 0 | |
| 17th June, 1861 .. .. | Small parcel | 7 0 | |
| 8th July, 1861 .. .. .. | 8¾ | 8 15 | Reef ran out at 150 feet deep |
| *Imperial Reef Yields.* | | | |
| 17th June, 1861 .. .. | 40 | 80 0 | |
| ,, .. .. | 36 lbs. | 61 10 | |
| 1st September, 1862 .. .. | 112 .. | 220 0 | Canut's Claim |
| 1st April, 1863 .. .. .. | 60 | 300 0 | |
| 8th September, 1863 .. .. | .. | 950 0 | Amalgam |
| 4th March, 1878 .. .. | 4½ | 2 5 | |
| 30th June, 1889 .. .. | 5 | 5 13 | Severs' Claim |
| 30th June, 1889 .. .. | 6 | 9 3 | Schmidt's Claim |
| 20th March, 1899 .. .. | 13 | 3 15 | Ellis' Claim |
| 19th May, 1899 .. .. | 7 | 48 4 | Ellis and Currie |

## 10. BRISTOL HILL REEFS.

The reefs, spurs, and veins of quartz on Bristol Hill were first worked near the surface in the fifties by miners who could make enough in this way to keep them during adverse times, and thus it was at first known as the Poor Man's diggings, but subsequently some richer reefs were developed.

On every side the gullies have been rich, some of them having yielded much coarse gold and many large nuggets. A great amount of surfacing, from 6 inches to 1 foot in depth, has been carried on all around, and in places nearly to the hilltop, and has yielded well.

The hill, which shows out conspicuously, lies to the south-west of the township. Its height is 905 feet above sea-level, and its prominence is due to a large porphyry dyke which forms a ridge across it.

This dyke averages 20 feet wide at the surface, and is cut across by five distinct dip faults, one of which is occupied by a porphyrite dyke trending nearly east and west. (Plate III.)

Of the other faults, three have moved the continuation of the porphyry dyke lying north of them to the east. The apparent movement caused by the one near Davies' cutting at the south end of the hill is 60 feet to the east, but the fifth fault has moved it to the west.

Along the main porphyry dyke a great amount of mining has been done on the quartz veins and spurs, but it proves that on the whole the spurs right on the dyke have been poor, especially at the south end of the hill, where Mr. Ivor Davies recently crushed a large amount of the spurry country from both sides of the dyke for a yield of only ½ dwt. per ton (Fig. 17); but occasionally a small spur will contain a richer patch, especially when crossing certain slate beds.

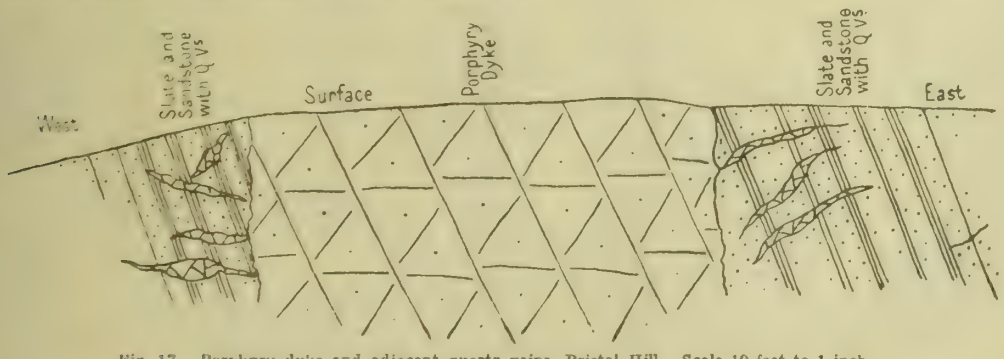



Fig. 17. Porphyry dyke and adjacent quartz veins, Bristol Hill. Scale 10 feet to 1 inch.

Plate III. shows the open cuts which have been worked; the one to the north followed a fairly defined reef formation on the east side of the dyke, and this gave payable yields at intervals for some years.

Most of the other open cuts were on erratic quartz spurs which did not continue payable to a depth, but besides these there are other spurry quartz formations, such as Coleman's, near the Old Cemetery, Wilson's, at the north end of the hill, and Conway's workings, close to the head of California Gully, all fairly good near the surface.

Richer than all of these and of a more defined character, was Ellery and Passmore's line of fissure reef. Although not very big, it was well defined and had a fairly long rich shoot of gold.

Amongst these numerous quartz veins and spurs there are indicators on both sides of the hill, one set in western dipping beds and the other in eastern beds, and between them is the big dyke. The dip of the beds shows that a main anticlinal fold traverses the hill, and that this fold has been penetrated close to its axial plane by the big dyke, which was faulted in several places before the intrusion of the cross dykes, of which there are two at least. One is an east and west phorphyrite dyke, which dips at 60° to the south, and is 15 feet wide, and has been injected along a fault line, and the other is the horizontal

amprophyre dyke which dips from Pekin Hill, on the north side of California Gully, into Bristol Hill. That the last-mentioned intrusion penetrates Bristol Hill is proved by the fact that the deeper workings have passed through a similar rock in the western shaft, but its exact position and relation to the auriferous quartz will remain uncertain until the Bristol Hill reefs are re-worked. Bristol Hill, Leviathan Reef, Mariner's, and other reefs in the Western Dyke Belt all show flat dykes of this kind. They once probably formed a more regular series of reefs, but have been gradually faulted to the west, as they are followed northward.

The following description of the reefs is given with details where possible, but the information, though carefully compiled from many sources and old records, remains incomplete.

The following reefs will be dealt with in order :—

Ellery and Passmore's Reef.
Bristol Hill, Eastern and Western Reefs.
Ivor Davies' South Bristol Hill Workings.
Coleman's Reef, and others.

*Ellery and Passmore's Reef.*

This reef was discovered in 1868, close to some rich nuggety surfacing on the western slope of Bristol Hill, and in the Western Dyke Belt (Plate III.).

It strikes north and south, and dips to the west at an angle of 60°, cutting slate and sandstone beds which dip eastward and strike N. 15° W.

On the average, the reef was a laminated fissure vein, from a few inches up to 2 feet in width, having a big barren quartz reef as its hanging wall, and a footwall of slate and sandstone.

The shoot pitched north at an angle of 1 in 5; it was cut at the surface in Ellery's south workings, and at a depth of 30 feet in the north shaft 150 feet away.

This shoot was 100 feet in length and highly payable, being worked from the surface to a depth of 225 feet in Ellery's claim, where a slide dipping north cut off the gold.

The claim known as No. 1 North was worked by Williams and party with good yields.

No. 2 North Claim was known as Boreland's, and here a shaft was sunk to a depth of 300 feet.

Ellery and Passmore's shoot was last worked from the main Bristol Hill western engine shaft north of Boreland's shaft.

On the south the reef was poor, Higgs and party working the reef 1 foot wide for a return of 6 dwts. of gold per ton.

In Ellery's claim, rich yields, such as 3¼ ozs. per ton from 7 inches of stone, were obtained at a depth of 212 feet, and the first crushing at the surface was over 3 ozs. per ton (11 tons for 36 ozs.). The following yields have been collected from the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| *Ellery and Passmore's, Bristol Hill.* | | | | |
| 14th September, 1868 .. .. | 11 | 36 | 0 | Ellery and Passmore |
| 12th October, 1868 .. .. | .. | 50 | 0 | |
| 30th November, 1868 .. .. | 32 | 70 | 0 | |
| 17th January, 1869 .. .. | 49 | 85 | 0 | |
| 14th February, 1869 .. .. | 60 | 178 | 15 | |
| 15th March, 1869 .. .. | 56 | 63 | 0 | |
| 24th March, 1869 .. .. | 56 | 118 | 0 | |
| 6th April, 1869 .. .. .. | 100 | 110 | 0 | |
| 17th May, 1869 .. .. | 100 | 60 | 0 | |
| 14th June, 1869 .. .. | 100 | 60 | 0 | |
| — June, 1869 .. .. .. | .. | .. | | Several nuggets; 32 ozs. in all |
| 12th July, 1869 .. .. | 100 | 90 | 0 | |
| 9th August, 1869 .. .. | 70 | 30 | 0 | |
| 14th September, 1869 .. .. | 11 | 36 | 0 | |
| 1st November, 1869 .. .. | 100 | 96 | 0 | |
| 21st November, 1869 .. .. | 11 | 35 | 15 | 212 feet deep, 6½ inches wide |
| 13th December, 1869 .. .. | .. | .. | | Splendid specimens, largest 11 ozs. |
| 30th October, 1871 .. .. | 30 | 32 | 0 | Below water-level |
| *Williams' Claim, Ellery's Line, Bristol Hill.* | | | | |
| 15th March, 1869 .. .. | 56 | 63 | 0 | Williams' No. 1 North Claim |
| 21st March, 1870 .. .. | 100 | 125 | 0 | |
| 26th September, 1870 .. .. | 106 | 51 | 0 | |
| 19th December, 1870 .. .. | 90 | 89 | 0 | |
| 26th December, 1870 .. .. | 220 | 65 | 10 | |
| — December, 1870 .. .. | 140 | 74 | 0 | Several feet wide |
| 9th March, 1871 .. .. | 5 | 5 | 0 | |
| 20th January, 1873 .. .. | 25 | 17 | 6 | |
| 29th December, 1873 .. .. | 27 | 9 | 3 | |
| 16th February, 1874 .. .. | 38 | 9 | 8½ | |
| *Boreland's Claim, No. 2 North, Ellery's Line, Bristol Hill.* | | | | |
| 23rd October, 1871 .. .. | 8 | 6 | 11 | |
| 3rd April, 1871 .. .. | 34 | 43 | 0 | |
| 20th January, 1873 .. .. | 13 | 12 | 18 | |

*Bristol Hill, Eastern and Western Reefs.*

The Eastern reef formation was fairly well defined at the northern end of Bristol Hill, and was worked extensively close to the dyke on the east side of it (Plate III.).

An open cut marks the position of the early workings from which some rich veins were mined, and from this open cut the open stopes extend downwards.

In 1871, the formation was still large and spurry, the stoping being 7 feet in width. The records state that here for a distance of 143 feet the yields were 5 dwts. to 7 dwts. per ton, and some crushings yielded as much as half-an-ounce per ton.

Operations were carried on from a deep shaft to the east of the reef, and, in August, 1871, it was worked out to water-level (240 feet deep) as far south as Coleman's claim.

In later years, Anderson Bros. worked below water-level, carrying on the work from the western shaft north of Boreland's whim shaft and close to the dam at the head tributary of California Gully.

This western shaft had already been sunk 400 feet by another company, and Anderson Bros. deepened and re-timbered it throughout in three compartments, making a main engine shaft 10 ft. 6 in. x 4 feet. There were four levels, as follows :—

No. 1 level at 230 feet.

No. 2 level at 340 feet. Here a vein was worked for a little while, but it soon cut out.

No. 3 level at 500 feet. A good payable reef was mined; it varied in width from 3 inches up to 3 feet, and was proved for 500 feet in length, and stoped out for most of that distance. A quantity of pyrites was obtained from this reef, and returned 4 ozs. per ton.

No. 4 level at 600 feet deep, cut the western reef at about 40 feet in, where good, though small, stone went underfoot.

In the 500-ft. crosscut the dyke was passed through at 527 feet from the shaft; it was 40 feet thick, and very hard.

This measurement shows that to a depth of 500 feet the dyke is practically vertical, and expands in width downwards.

The above notes are mainly gathered from the company's reports, but one record gives the deepest workings as 630 feet, so possibly a winze was sunk from the 600-ft. level on the small rich stone.

The following yields are from the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | *Eastern Shaft Workings.* | | |
| 10th April, 1865 .. .. | 10 | 5 10 | |
| 1st October, 1866 .. .. | 8 | 14 0 | |
| 25th January, 1867 .. .. | 11 | 42 10 | Also rich specimens |
| 18th March, 1867 .. .. | 19 | 32 10 | |
| 8th April, 1867 .. .. | 24 | 12 10 | |
| 11th November, 1867 .. .. | 5 | 3 10 | |
| 13th February, 1871 .. .. | 119 | 58 11 | |
| 10th April, 1871 .. .. | 8 | 16 16 | |
| 8th May, 1871 .. .. | 102 | 30 12 | |
| 20th March, 1872 .. .. | 13 | 4 6 | |
| 4th July, 1872 .. .. | 18 | 5 17 | |
| 6th May, 1872 .. .. | 72 | 13 15 | |
| 1st June, 1874 .. .. | 913 | 376 12 | Quarter. 300 feet deep |
| | *Western Shaft. Anderson Bros.' Workings.* | | |
| 10th April, 1878 .. .. | 248 | 101 14 | 530 feet deep |
| 30th September, 1878 .. .. | 13 | 31 18 | Pyrites |
| 4th October, 1878 .. .. | 310 | 157 10 | Quarterly return |
| 8th January, 1879 .. .. | 1,150 | 536 9 | 500 feet to 530 feet deep |
| 10th March, 1879 .. .. | 220 | 178 0 | |
| 7th April, 1879 .. .. | 1,709 | 868 18 | 400 feet to 500 feet deep |
| ,, ,, .. .. | 5 | 20 17 | Pyrites |
| 7th July, 1879 .. .. | 1,721 | 678 2 | 400 feet to 500 feet deep |
| ,, ,, .. .. | 14 | 54 4 | Pyrites |
| 30th September, 1879 .. .. | 883 | 163 18 | 300 feet and 430 feet deep |
| 30th June, 1880 .. .. | 545 | 142 14 | 500 feet to 600 feet deep |
| ,, ,, .. .. | 7 | 22 2 | Pyrites |
| — June, 1880 .. .. | 136 | 25 18 | 280 feet and 353 feet deep |
| 30th July, 1880 .. .. | 152 | 78 1 | Tribute party |
| 27th August, 1880 .. .. | 495 | 169 12 | Tribute. One month. 8 feet wide |
| 5th January, 1881 .. .. | 982 | 263 10 | |
| 15th April, 1881 .. .. | 340 | 85 18 | 330 feet and 440 feet deep |

*South Bristol Hill.—Ivor Davies' Open Cut Workings.*

At the south end of Bristol Hill, just above the Old Cemetery, Mr. Ivor Davies, proprietor of the Bristol Battery, has carried out extensive mining operations without success.

The workings are on both sides of the big porphyry dyke, the eastern being the more extensive (Plate III.).

The material mined was slate and sandstone with quartz spurs, and in places a width of 20 feet was sent to the battery.

The work was carried on from large open cuts, the eastern cut having a double truck line. Haulage was done by means of a large winding drum, and the power was obtained from horseworks. The trucks when brought to the surface were shunted to the hoppers, under which carts were filled and the ore was taken across the gully to the battery, the cost of mining, &c., being reduced as far as possible.

Crushing was done by five stamps, whilst the other stamps were crushing for the public. Though the work was carried out with the greatest economy, it did not pay, the yields being only ½ dwt. per ton, but Mr. Davies, who kindly supplied the following yields, informed me that a very slight improvement would have paid all expenses of mining and crushing.

| Tons crushed. | Gold value—per ton. £ | s | d | |
|---|---|---|---|---|
| 70 .. | 0 | 2 | 3 | (Besides a patch of 16½ ozs. in a vein near the hoppers). |
| 400 .. | 0 | 1 | 0 | |
| 160 .. | 0 | 2 | 0 | |
| 800 .. | 0 | 3 | 0 | |

Total .. 1,430 (excluding patch) for average yield of 2s. ¾d. per ton.

*Bristol Hill.—Coleman's Reef.*

Coleman's Reef lies just north of the Maryborough Old Cemetery, and on the eastern slope of Bristol Hill (Plate III.). It is about 4 chains east of the main Bristol Hill porphyry dyke, and is not connected with the spurry country close to the dyke wall.

It strikes N. 10° W., and dips westward at 60° across the strata, which dip east at an angle of 65°.

The reef formation is of broken crushed slate and sandstone penetrated by large quartz spurs, which have much iron oxide on the joints and in small fractures. The slate predominates, but some broken beds of sandstone with pyrites decomposed here and there also occur. There are three shafts about 50 feet deep, and an open cut about 30 feet in the deepest part.

A few yields were obtained from the *Maryborough Advertiser*, as follows :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | *Coleman's Reef.* | | |
| 2nd December, 1867 .. .. | 9 | 2 5 | |
| 15th June, 1868 .. .. | 7 | 1 1 | |
| 22nd July, 1868 .. .. | 26 | 5 0 | |
| 29th March, 1869 .. .. | 38 | 46 0 | |
| 19th April, 1869 .. .. | 26 | 23 0 | |

*Some Other Reef Formations.*

(See Plate III.)

*Pascoe and Ellery's.*—This is a formation of large quartz spurs (just N.E. of Ellery and Passmore's claim) in a formation about 4 feet wide. The strike is N. 4° W., and it dips 53° to the west, cutting beds dipping 65° to the east on an average, but very crushed and broken. The hanging wall is good, but the footwall very spurry. The only good yield was obtained when the reef was first opened in the sixties by Williams and party, who crushed 40 tons for a yield of 40 ozs., I am informed. Pascoe and Ellery did not obtain payable stone.

*Seebeck's Claim (South Bristol Hill).*—This claim was worked at the south end of Bristol Hill on large quartz spurs just north of Ivor Davies' open cuts. Some good yields, up to nearly an ounce per ton, were obtained. A few yields are appended :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| .. .. .. .. | 161 | 114 0 | Cambrian Battery |
| 30th September, 1884 .. .. | 40 | 16 12 | |
| 31st March, 1886 .. .. | 40 | 35 12 | |

*Coleman's Claim (North Bristol Hill).*—Quartz spurs were worked in the reef formation on the west side of the dyke opposite the Eastern Reef workings and open cut, for yields averaging 5½ dwt. per ton, worked during 1900–1901. The following returns are taken from the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 14th May, 1900 .. .. | 20 | 7 1 | |
| 18th February, 1901 .. .. | 14 | 5 15 | |
| 23rd September, 1901 .. .. | 16 | 3 15 | |
| 16th December, 1901 .. .. | 3 | 1 9 | |
| 31st December, 1901 .. .. | 43 | 8 5 | |

On the south of Ellery and Passmore's line, Worral obtained rich specimens. Other workings on the north, near the old battery, were Wilson's and Conway's, near California Gully, on spurry formations which were payable near the surface. There were also many prospecting claims on quartz spurs, about which no information is obtainable.

The following yields from the *Advertiser* mining intelligence paragraphs will show that a great amount of mining was done on veins and spurs, as well as on the main reef.

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| *Martin, South Bristol.* | | | |
| 9th September, 1867 .. .. | 16 | 1 1 | South Bristol Hill |
| *Armenian Party, South Bristol.* | | | |
| 30th December, 1867 .. .. | 11 | 8 0 | South Bristol Hill |
| *Wilson and Party.* | | | |
| 4th July, 1870 .. .. .. | 94 | 154 0 | North Bristol Hill |
| *Bristol Extended.* | | | |
| 12th January, 1874 .. .. | 130 | 47 0 | |
| 26th January, 1874 .. .. | 157 | 67 0 | |
| *Humphry and Party.* | | | |
| 22nd December, 1873 . .. | 2½ | 2 14 | |
| 16th February, 1874 .. .. | 20 | 23 0 | |
| 13th July, 1874 .. .. | 110 | 17 10 | |
| 24th August, 1874 .. .. | 89 | 40 0 | |
| *Worral's Claim.* | | | |
| 9th December, 1885 .. .. | 8 | 1 0 | And rich specimens on surface |
| *Conway and Party.* | | | |
| 30th June, 1885 .. .. | 70 | 25 18 | North Bristol Hill |
| *Carlyon and Party.* | | | |
| 7th August, 1890 .. .. | 35 | 5 17 | |
| *Wilson's Claim.* | | | |
| 8th May, 1893 .. .. | 92 | 20 5 | North Bristol Hill |
| 10th December, 1895 .. .. | 23 | 18 4 | ,, ,, |
| 27th January, 1896 .. .. | 14 | 3 6 | ,, ,, |
| 4th May, 1896 .. .. | 10 | 8 3 | ,, ,, |
| *Greenwood and Party.* | | | |
| 31st March, 1893 .. .. | 148 | 52 10 | |
| 15th May, 1893 .. .. | 92 | 20 5 | |
| 29th July, 1893 .. .. | 71 | 12 5 | |
| 11th September, 1893 .. .. | 104 | 13 7 | |
| 18th December, 1893 .. .. | 40 | 7 8 | |
| *Barclay and Party.* | | | |
| 22nd May, 1893 .. .. | 30 | 6 2 | |
| 21st June, 1893 .. .. | 8 | 6 2 | |
| *Walker and Party.* | | | |
| 3rd July, 1893 .. .. | 12 | 3 4 | |
| *McCann and Party.* | | | |
| 31st December, 1893 .. .. | 234 | 49 3 | |
| *Withers and Party.* | | | |
| 17th July, 1893 .. .. | 13 | 3 5 | |
| 28th August, 1893 .. .. | .. | 7 13 | |
| *Curry and Party.* | | | |
| 31st July, 1893 .. .. | 33 | 5 9 | |
| 21st August, 1893 .. .. | 50 | 7 10 | |
| *Judd and Party.* | | | |
| 16th October, 1893 .. .. | 15 | 4 0 | |
| 31st December, 1893 .. .. | 23 | 9 4 | |
| *Price and Party.* | | | |
| 15th January, 1894 .. .. | 80 | 19 2 | |
| 19th March, 1894 .. .. | 33 | 14 4 | |
| *McMullen and Party.* | | | |
| 17th June, 1896 .. .. | 12 | 5 0 | |
| 17th August, 1896 .. .. | 5 | 9 0 | |
| 17th September, 1896 .. .. | 4 | 4 2 | |
| *Baker and Party.* | | | |
| 15th May, 1899 .. .. | 7 | 9 1 | |

## 11. Shaw's Reef.

This reef is situated 30 chains to the north-east of the Simpson railway station and close to Four-mile Creek, at Marchant's garden.

The reef is in the belt of rocks just east of the Main Eastern Dyke Belt, and itself is void of dykes, the nearest being Mulligan's.

It was opened in 1873, below 20 feet of alluvial. Rich yields were obtained, and the Shaw's Reef Co. paid £14,000 in dividends from 1886 to 1896.

The surrounding rocks are slates and sandstones of brown and grey colour, as usually met with throughout the field; but quartzite also occurs and blue-black pyritic slate, which is only occasionally found among the Maryborough rocks, and then only in narrow beds.

The reef is formed of laminated quartz with an average width of 8 inches, thickening to 1 foot in places. It carries specks of galena and pyrites where the rich shoot was followed on its downward pitch of 45° to the south, above the slide.

The reef strikes N. 11° W. and then dips 88° eastward down to the slide, below which it changes to 83° eastward, whilst the beds also dip slightly to the east.

The main engine shaft has been sunk to a depth of 510 feet, and several crosscuts and levels have been driven.

| Level. | Depth. | Crosscuts. | Drives North. | Drives South. |
|---|---|---|---|---|
| No. 1 .. | 100 feet .. | 50 feet west .. .. | 495 feet .. | 250 feet |
| No. 2 .. | 175 ,, .. | 47 ,, ,, .. .. | 520 ,, .. | 250 ,, |
| No. 3 .. | 250 ,, .. | 45 feet west .. )<br>200 feet east .. ) | 420 ,, .. | 250 ,, |
| No. 4 .. | 325 ,, .. | 43 feet west .. .. | 325 ,, .. | 570 ,, (past the Extended shaft). |
| No. 5 .. | 400 ,, .. | 41 ,, ,, .. .. | 250 ,, .. | 620 feet |
| No. 6 .. | 500 ,, .. | 90 feet west (cut reef at 371 feet) | 320 ,, .. | 422 ,, |

About 50 feet to the south of the main shaft is the old original whim shaft, from which such rich yields were obtained down to a depth of 100 feet. Two hundred feet to the north of the main shaft Cassell's shaft was sunk to a depth of 100 feet; around it the reef has now all been stoped out to the surface.

The ground stoped out to the north and south of the main shaft shows a length of about 450 feet of payable reef, some very rich down to the slide at 400 feet deep, which moved the reef 3 feet to the west. The slide is ¼-inch wide and filled with yellow "pug" and gritty material, and pitches 12° north.

Under the slide the ground some stoping was done to the north of the main shaft, and south of the extended shaft; but this was poorer ground than that above the slide.

Where last stoped the reef showed only 6 feet in length of the rich stone going underfoot.

The water level was met with at 80 feet from the surface. The late manager, Mr. John Martin, who kindly supplied me with much information concerning Shaw's Reef, informed me that the mine closed down because, with the narrowing of the reef and the shortening of the rich portion, there was not sufficient inducement to warrant the Company erecting the stronger pumping plant necessary to deal with the water, which the 9-inch lift was barely large enough to cope with.

In the workings carried out from the extended shaft, which was sunk to a depth of 325 feet, the slide was cut at 12 feet from the shaft in the west crosscut. Some stoping was done at the 200-ft. level, and at 200 feet south of the extended shaft, but on a small reef and for poor yields of gold.

The following are some of the yields from the Shaw's Reef in the main workings and south of the extended shaft:—

An early yield, 8th September, 1873—7 tons for 12 ozs. 15 dwts. of gold.
Old whim shaft (100-ft. level), 72 tons for 570 ozs. 12 dwts. (about 8 ozs. per ton).
Also another crushing for 477 ozs. 15 dwts. (south of the whim shaft).
A crushing at the Cambrian Battery of 107 tons yielded 460 ozs.; and 263 tons yielded 1,166 ozs.
Main shaft (below the slide), 1,124 tons for 883 ozs. 14 dwts; the best being 90 tons for 104 ozs.
Extended shaft (200-ft. level), poorst one outside Shaw's main shoot, 70 tons for 6 ozs. 17 dwts. in all.

A full record of the tonnage from Shaw's Reef cannot be obtained, but the total yield has been kept; it amounts in all to 11,465 ozs., valued at over £45,000.

*Shaw's North.*

The northern portion of Shaw's reef in general character and surroundings is similar to the southern portion. It has been worked to a depth of 300 feet, the principal work having been done in 1888, when it paid dividends.

There is a main engine shaft 300 feet deep, and levels &c., driven at 80 feet, 180 feet, and 280 feet.

Crushings as follows are recorded:—

Shaw's North Company, 1½ ozs. per ton.
Tributers, 152 tons for 573 ozs., or over 3¼ ozs. to the ton.

## 12. Flagstaff Reef.

The Flagstaff Reef is on the Carisbrook-road, about 1¼ miles to the east of Maryborough. It is just outside the Eastern Dyke Belt, and in the adjacent rocks there is no evidence of any dykes until the Eastern Dyke Belt is reached.

When opened in the fifties, it was only a few inches wide at the surface, and yielded 1 ounce per ton. At first it was not payable, but at a depth of 70 feet it widened to an average of 1 foot, and was worked continuously for many years, sometimes with highly payable results.

The main shaft is said to be 425 feet deep, with levels at 275 feet, where 500 feet of driving has been done to the north; 350 feet, where 350 feet of driving has been done to the north; and 425 feet, where 53 feet has been driven north. This indicates that the pitch of the shoot and block is to the south. The strike of the line, as far as it can be taken from the few surface workings, is about N. 20° W., and the dip is 70° westwards, cutting across beds dipping east.

The reef is a laminated mineralized quartz body, and carries rich pyrites, which at times is worth £1 per ton of quartz.

Water-level is at 130 feet, and it is said that both Flagstaff and Blucher's Reefs drain one another. These two reefs are not on the same line, but may be indirectly connected near the large fault into which Ellis' dyke is intruded, near Clough's allotment, Schicer Gully.

According to reliable information, there is still good ore about 25 feet to the south of the main shaft on a small reef, where 1 ounce to the ton was being crushed, when the tribute party working had to quit on account of the water being too heavy for ordinary appliances after the removal of the pumping plant.

The following yields are from the *Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | | *Flagstaff Reef.* | |
| 6th June, 1859 .. .. .. | 12½ | 166 0 | |
| .. .. .. .. | 5 | 15 0 | Next prosp. claim |
| 30th August, 1861 .. .. | 25 | 35 0 | |
| 1st April, 1863 .. .. .. | 50 | 200 0 | 18 inches stone |
| 20th April, 1863 .. .. | 88 | 72 11 | 180 feet deep; 2 feet of stone. Christian's claim |
| 1st May, 1863 .. .. .. | 10 | 54 0 | McLellan's claim |
| 6th June, 1863 .. .. .. | 30 | 100 0 | ,, ,, |
| 14th August, 1863 .. .. | 2 | 18 0 | Christian's claim |
| 30th September, 1863 .. .. | 18 | 81 0 | Eleven weeks; three men. McLellan's claim |
| 14th October, 1863 .. .. | 1½ | 12 0 | Christian's claim |
| 9th March, 1864 .. .. | 26 | 164 12 | 80-ft. level; value per ounce, £3 18s. 6d. Banks' and Higham's No. 4 claim |
| 22nd April, 1864 .. .. | 31 | 173 0 | |
| 25th May, 1864 .. .. | 30 | 130 0 | Higham's No. 4 claim |
| 27th January, 1865 .. .. | 105 | 256 0 | Geldart's claim |
| 7th August, 1865 .. .. | 56 | 59 0 | |
| 20th August, 1865 .. .. | 6 | 12 0 | Banks' No. 4 claim |
| 4th September, 1865 .. .. | 5 | 25 0 | 200-ft. level |
| 18th September, 1865 .. .. | 7½ | 70 17 | |
| 4th October, 1865 .. .. | 8½ | 63 0 | 205 feet deep; engine shaft block, 28 feet long |
| 30th October, 1865 .. .. | 15 | 82 0 | |
| 29th November, 1865 .. .. | 10 | 43 0 | |
| 12th March, 1866 .. .. | 5 | 11 0 | Anscombe's claim |
| 14th May, 1866 .. .. | 11 | 19 10 | |
| 5th September, 1866 .. .. | 3 | 3 15 | |
| 26th October, 1866 .. .. | 6 | 6 0 | Anscombe's claim |
| 25th December, 1863 .. .. | 12 | 85 0 | No. 3 North claim |
| 10th August, 1868 .. .. | 32 | 94 0 | |
| 29th September, 1868 .. .. | 21 | 32 0 | |
| 1th November, 1868 .. .. | 17 | 54 0 | |
| 58th June, 1859 .. .. | 175 | 116 0 | |
| 26th July, 1869 .. .. | 51 | 45 0 | |
| ,, ,, .. .. | 14 | 59 0 | |
| 27th September, 1869 .. .. | 56 | 85 0 | |
| ,, ,, .. .. | 38 | 7 0 | Tailings washed |
| 18th October, 1869 .. .. | 72 | 89 0 | |
| 8th November, 1869 .. .. | 105 | 114 0 | |
| 13th December, 1869 .. .. | 3 | 14 17 | Pyrites (consts.) |
| 14th February, 1870 .. .. | 4½ | 24 10 | Tailings washed |
| 21st October, 1872 .. .. | 7½ | 1 17½ | McDonald |
| 24th August, 1881 .. .. | 6½ | 2 9 | McClellan's claim |
| 30th December, 1882 .. .. | 11½ | 17 18 | |
| 30th June, 1892 .. .. | 20 | 26 16 | Quarterly record |
| 30th September, 1892 .. .. | 65 | 64 14 | |
| 31st March, 1892 .. .. | 104 | 22 3 | Williams' claim |
| 31st December, 1892 .. .. | 50 | 46 13 | |
| 30th January, 1893 .. .. | 21 | 23 0 | Williams' claim |
| 13th March, 1893 .. .. | 24 | 16 17 | |
| 1st May, 1893 .. .. .. | .. | 16 0 | No tonnage given |
| 18th September, 1893 .. .. | 12 | 11 9 | |
| 6th November, 1893 .. .. | 10 | 4 1 | |
| | | *New Flagstaff.* | |
| 1st January, 1869 .. .. | 36 | 76 0 | Trial crushing |
| 15th January, 1869 .. .. | .. | 10 0 | Powder keg of quartz; very rich |
| 8th February, 1869 .. .. | 34 | 92 10 | |
| 15th March, 1869 .. .. | 66 | 108 0 | |
| 19th April, 1869 .. .. | 50 | 93 5 | |
| 21st May, 1869 .. .. .. | 84 | 120 0 | 4 tons pyrites saved |
| 28th June, 1869 .. .. | 4¾ | 3 17 | |
| 12th February, 1882 .. .. | 30 | 7 3 | |
| ———, 1882 .. .. .. | 4 | 2 10 | |
| 7th March, 1892 .. .. | 70 | 12 0 | |
| 25th May, 1892 .. .. | 20 | 26 16 | Williams' claim |
| 3rd October, 1892 .. .. | 37 | 77 3 | ,, ,, |
| 19th December, 1892 .. .. | 21 | 21 2 | ,, ,, |

## 13. Telegraph Reef.

The Telegraph Reef, which is close to the old Carisbrook-road, and 1 mile north-east of the locomotive engine shops, was first prospected in 1859, but the main work was done in the seventies below water-level.

It occurs in the Eastern Dyke Belt, along a wide dyke, which carries block reefs on both walls, in the past known as the Eastern and Western Reefs.

The average strike of the dyke line is N. 15° W., and it dips 80° westward across the Ordovician beds, which are mainly slate and very much crushed along the line.

A number of shafts on the underlay have been sunk, some of them to water-level (162 feet). The main engine shaft has been sunk 350 feet vertical and to 400 feet deep on the underlay, so in any future work the shaft would first have to be straightened up.

The surface workings and shafts along the line extend for over 800 feet.

The shoots pitch north. The Western Reef, which has the dyke as its footwall, was always the widest and richest.

The average width of ore is 15 inches, but sometimes it bulged to a thickness of 22 inches of good payable stone, and in some parts rich. The quartz was laminated, vitreous, and hard in places, and at present in the south end bottom levels is said to be 7 inches thick.

The dyke at the surface is a soft rock, red to yellow in colour, with white kaolinized felspar faintly showing, but below water-level it is a hard dark-green to black rock with the usual prismatic jointing, which causes the dyke rock to break into small angular blocks.

Yields have been very good, and, on the whole, this line has been one of the best in the belt, payable quartz being found on both walls of the dyke.

In any future work, the general character of the quartz reefs connected with dykes in this district and the probable occurrence of other rich blocks beneath those already worked, should be kept well in view, the dyke wall being easily followed, and being the only guide to other blocks.

The following yields are from the *Maryborough Advertiser*, and show that in 1878 and 1879 there were yields of over 2 ounces to the ton at a depth of 260 feet, and at a depth of 400 feet a yield of 2 ounces to the ton is recorded in 1881 :—

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| *Telegraph Reef.* | | | | |
| 1st October, 1866 | 43 | 14 | 11 | |
| 4th September, 1871 | 11 | 4 | 3 | |
| 11th December, 1871 | 14 | 7 | 10 | |
| 8th January, 1872 | 44 | 27 | 0 | Arnell |
| 17th June, 1872 | 93 | 150 | 0 | Bishop (amal.) |
| 26th August, 1872 | 83 | 27 | 3 | |
| 23rd September, 1872 | 39 | 26 | 10 | |
| 7th October, 1872 | 18 | 8 | 8 | Martin |
| 21st October, 1872 | 50 | 17 | 5 | Bishop |
| 28th October, 1872 | 40 | 10 | 10 | Carey and Martin |
| 25th November, 1872 | 21 | 6 | 6 | Martin |
| 30th December, 1872 | 30 | 13 | 0 | ,, |
| 10th February, 1873 | 44 | 26 | 0 | Carey and Martin |
| ,, ,, ,, | 27 | 9 | 6 | Williams |
| 24th March, 1873 | 38 | 17 | 0 | Carey and Martin |
| 26th May, 1873 | 38 | 16 | 0 | Williams |
| ,, ,, | 82 | 50 | 0 | Bishop |
| 7th July, 1873 .. | 27 | 4 | 16 | |
| 24th August, 1873 | 25 | 11 | 10 | Williams |
| 13th November, 1876 | 80 | 54 | 0 | |
| 25th December, 1876 | 103 | 76 | 0 | In eight weeks |
| 12th March, 1877 | .. | 358 | 0 | |
| 23rd April, 1877 | 100 | 150 | 0 | |
| 10th March, 1879 | 47 | 110 | 0 | Over 2 ounces per ton |
| 21st April, 1879 | 54 | 96 | 0 | |
| 13th June, 1879 | 11½ | 13 | 17 | |
| 26th July, 1879 | 110 | 163 | 13 | |
| 11th August, 1879 | 124 | 185 | 0 | |
| 8th September, 1879 | 134 | 138 | 0 | |
| 17tth November, 1879 | 79 | 184 | 16 | Over 2 ounces per ton |
| 7th July, 1879 .. | 200 | 280 | 0 | |
| 28th July, 1879 | 228 | 340 | 11 | |
| 9th June, 1880 ... | 12¼ | 24 | 4 | |
| *Telegraph United Co.* | | | | |
| 19th November, 1877 | 10 | 8 | 15 | |
| 11th March, 1878 | 164 | 357 | 2 | 260 feet deep |
| 22nd May, 1878 | 200 | 250 | 0 | 274 feet deep |
| 17th June, 1878 | 61½ | 38 | 2 | |
| 3rd July, 1878 .. | 93 | 114 | 15 | Western Reef |
| ,, .. .. | 32 | 11 | 15 | Eastern Reef |
| 8th July, 1878 .. | 205 | 250 | 0 | |
| 17th July, 1878 | 62½ | 74 | 18 | |
| 16th October, 1878 | 202 | 195 | 10 | |
| 12th January, 1880 | 5 | 61 | 0 | |
| *Telegraph Tribute.* | | | | |
| 10th October, 1880 | 32 | 53 | 0 | Quarterly record. Matthews and Ross |
| 19th June, 1880 | 19 | 30 | 8 | |
| *Telegraph Extended.* | | | | |
| 1st October, 1880 | 19½ | 28 | 16 | |
| 1st November, 1880 | 12½ | 23 | 12 | Eastern Reef |
| ,, ,, | 13 | 25 | 14 | Western Reef |
| ,, ,, | 16 | 12 | 15 | 273-ft. level |
| 1st April, 1881 .. | 53 | 82 | 4 | |
| 6th April, 1881 .. | 133 | 252 | 15 | First quarter, depth 367 feet; and stone 6" |
| 18th April, 1881 | 27 | 83 | 0 | |
| 6th July, 1881 .. | 80 | 160 | 0 | 400-ft. level |
| 11th August, 1881 | 29 | 47 | 10 | |
| 1st October, 1889 | 7¼ | 6 | 12 | Coleman |

## 14. McFarlane's Reef.

This reef is situated in the northern part of Shaw's Belt, and south-west of Havelock Station. It was opened in the eighties by McFarlane and Son, who got payable yields for some time before the company took the reef up.

The surrounding beds are similar to those at Shaw's line of reef, and in most features it was similar to that reef but for the fact that stibnite was found in large patches.

The quartz is laminated and well mineralized, and from a few inches up to 3 feet wide; the latter width was attained in the No. 4 level, where it carried antimony ore similar to that found in the No. 3 level.

The reef strikes N. 11° W., but, on account of the alluvial covering, the dip cannot be seen; it is said to be slightly to the east.

The main engine shaft was sunk to a depth of 350 feet, and several crosscuts and levels were driven but little information is obtainable concerning them.

Water-level was about 100 feet below the surface, and in the deeper levels the water was fairly heavy.

In 1889, lenticular patches of antimony ore (stibnite) were found but they were not connected throughout in the form of a vein. Report states that it contained 70 per cent. antimony and some gold in addition, but the actual value is not recorded. A quantity of this antimony is said to have been left in the old stopes.

The length of the shoot of gold is not recorded, but the value may be gauged from the appended yields and the quantity available per fortnight; the average value was 15 dwts. per ton. The antimony is said to have interfered with the gold yields, and to have been the main cause of closing down.

In a private report made for a company in recent years the total amount of ore crushed is given as 1,125 tons, and the total gold recovered 883 ozs. 15 dwts., that is, about 15 dwts. per ton.

Individual yields taken from the press reports give—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 1886 .. .. .. .. | .. | .. | 80-ft. level; reef 3 feet wide, going 15 dwt. per ton |
| 1887 .. .. .. .. | .. | .. | Water heavy |
| 28th September, 1888 .. .. | 38 | 31 11 | |
| 27th November, 1888 .. .. | .. | 69 0 | Eight days' crushing |
| 11th December, 1888 .. .. | .. | 80 14 | Fortnight |
| 18th December, 1888 .. .. | 40 | 25 14 | |
| 8th January, 1889 .. .. | .. | 20 11 | Three days' crushing |
| 22nd January, 1889 .. .. | .. | 30 2 | Seven days' crushing |
| 19th February, 1889 .. .. | .. | 65 7 | |
| 17th September, 1889 .. .. | .. | .. | |
| 5th November, 1889 .. .. | .. | 113 0 | Amalgam |
| 12th November, 1889 .. .. | .. | 84 0 | Ten days' crushing |
| 10th December, 1889 .. .. | .. | 21 5 | Four days' crushing |
| Date not given .. .. .. | 164 | 195 0 | Crushed at Cambrian Battery |

## 15. Amy Castles Reef.

The Amy Castles Reef is situated on the main lead, between allotments 17 and 22, parish of Maryborough, and was found whilst working the alluvial ground.

It is in the Eastern Dyke Belt, and one of the last worked in the northern part of that area; it is probably on the line of the Telegraph Dyke.

The dyke and its accompanying blocks of quartz strike N. 10° W., and dip westward at an angle of 75°.

The quartz varies from a few inches up to 1 foot in thickness, much of it being 6 inches wide, as it is where now exposed at the 218-ft. level (bottom level).

The dyke is a lamprophyre, 12 feet wide in places, and forms the footwall country to the reef.

The surface workings, and those above water-level, were carried on from several shafts, but afterwards the company sunk the main engine shaft to a depth of 218 feet (not including the well) to work the deeper levels.

Crosscuts, 72 feet in length at the 112-ft. level, and about 50 feet in length at the 218-ft. level, were put in east, and levels were driven north and south.

The 112-ft. level is driven south 186 feet, and north 156 feet, and connected by a rise with the old workings at the 83-ft. level, which was driven 270 feet along the dyke from the old north shaft.

The 218-ft. level is driven 20 feet south and 10 feet north, on a small reef on the western wall of the dyke, which is at this point a very hard and dense green to black rock. Most of the above notes were obtained from Mr. R. A. Moon, who was mining engineer to the company.

The blocks were apparently too small and not rich enough in the short shoots to pay below water-level. A few yields are added to show the value of the quartz when last worked:—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 7th August, 1899 .. .. | 23 | 30 6 | |
| 13th December, 1899 .. .. | 32 | 30 7 | |
| 2nd April, 1900 .. .. | 16 | 20 0 | |
| 31st June, 1900 .. .. | 20 | 19 0 | |
| | 156 | 129 10 | Crushed at Davies's Battery |

## 16. Native Youth Reef.

The Native Youth Reef (Fig. 18) was opened in the sixties, but the main work was done in the early nineties by Bishop Bros. and party. It is situated to the east of Primrose Hill, and crosses Griffith's Gully to the south of Earl's Reef.

It is an east and west reef which has formed on the wall of a large porphyrite dyke 15 feet wide, dipping south at an angle of 60°. The quartz is on the footwall of the reef and thus has a hanging wall of dyke rock and a footwall of alternating slate and sandstone. The strata strike N. 11° W., and dip eastwards at an angle of 80°. The reef and dyke strike W. 5° S., and dip southwards at an angle of 60°.

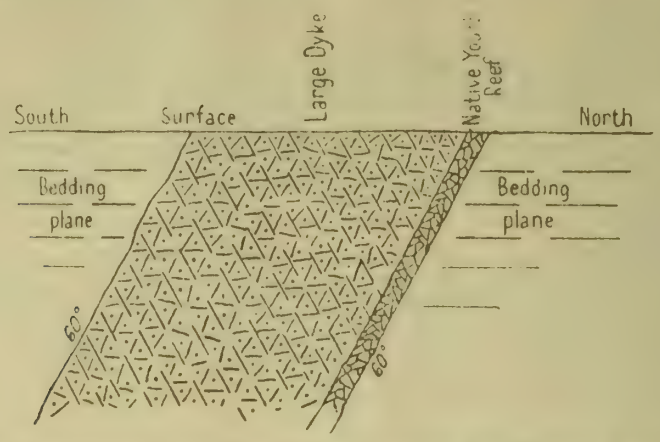



Fig. 18. Dyke occupying east and west fault line, with reef on footwall. Native Youth. Scale 10 feet to 1 inch.

The main whip shaft is sunk to a depth of 240 feet, and the reef was worked and stoped to 200 feet deep, where water is said to have prevented further exploiting, although good payable quartz is known to be going underfoot.

The quartz on the average was about 1 foot wide, but varied from 6 inches to 2 feet. The main block of quartz was worked for a distance of 270 feet, with smaller blocks to the west.

Between Bishop's and Arnold's workings a small fault moved the reef and dyke 9 feet to the south; the fault dipped at an angle of 45° W. towards the main shaft. Arnold's is the most easterly shaft on this line of reef.

The quartz, as is generally the case when associated directly with dykes, is hard and vitreous and generally shows some iron oxide near the walls. The hanging wall has been the most regular, and most of the bulges in the stone have been on the footwall side.

A large quantity of quartz has been crushed from this reef for 10 dwts. up to 1 oz. 5 dwts. of gold per ton, the latter being the best ore obtained in this reef.

Arnold's mine to the east of the fault is reported to have been stoped to 100 feet and to have yielded 10 dwts. to 15 dwts. of gold per ton of ore.

The dyke at the surface is a white to pale-yellow decomposed rock, and is just hardening at 200 feet deep, but below the water level it increases in hardness and darkens in colour. Hand specimens from this dyke are similar to the east and west dyke at Bristol Hill; both dykes are nearly in line and they probably occupy different parts of the same fault.

Alongside Griffith's Gully there is a large porphyry dyke running north and south and the Native Youth dyke probably cuts across it near the gully.

It is interesting to note that a sample of dyke rock taken from opposite Arnold's shaft, from the middle of the 15 feet dyke yielded a fair assay of gold, considering it was wholly soft dyke rock with no quartz veins present.

Assay No. 558, Mines Laboratory—

| | Gold. | Silver. |
|---|---|---|
| Ferruginous dyke .. .. .. .. .. .. | 1 dwt. 5 grs. | Nil. |

Considering the length of the reef and that below water level this mine has received no attention, it should be classed as one of those worthy of further development.

The following yields are some of those recorded in the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 3rd October, 1892 .. .. | 9 | 8 15 | Bishop |
| 7th November, 1892 .. .. | 7 | 5 9 | |
| 22nd December, 1892 .. .. | 4 | 5 8 | |
| 1st May, 1893 .. .. .. | 11 | 6 15 | |
| 31st September, 1894 .. .. | 49 | 36 2 | |
| 24th December, 1894 .. .. | 25 | 19 7 | |
| 31st December, 1894 .. .. | .. | 13 14 | |
| 13th May, 1895 .. .. | 34 | 17 15 | |
| 30th June, 1895 .. .. | 3 | 2 5 | |
| 22nd July, 1895 .. .. | 31 | 20 2 | |
| 21st October, 1895 .. .. | 26 | 19 9 | |
| 20th December, 1895 .. .. | 17 | 10 0 | |
| 25th December, 1895 .. .. | 2 | 1 8 | |
| 13th April, 1896 .. .. | 33 | 30 9 | |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| 8th June, 1896 .. .. .. | 4 | 4 | 0 | |
| 30th June, 1896 .. .. | 27 | 23 | 1 | |
| 17th August 1896 .. .. | 41 | 27 | 10 | |
| 31st December, 1896 .. .. | 40 | 29 | 11 | Quarterly record |
| (Above crushings included in this) | 487 | 304 | 13 | (Cambrian Battery returns for Bishop and Ramsay) |
| 5th December, 1892 .. .. | 7 | 3 | 0 | Arnold's |
| 12th December, 1894 .. .. | 32 | 19 | 7 | Price |
| 16th December, 1894 .. .. | 8 | 7 | 0 | |
| 24th December, 1894 .. .. | 25 | 10 | 3 | |
| 8th July, 1895 .. .. .. | 18 | 9 | 13 | |
| | 83 | 46 | 3 | |
| 30th September, 1895 .. .. | 87 | 34 | 5 | Cox |
| 30th September, 1895 .. .. | 30 | 12 | 13 | Whiting |
| 2nd August, 1897 .. .. | 9 | 6 | 8 | Dodd |

*Native Youth West.*

The Native Youth line of reef and dyke can be traced westward across Griffith's Gully and up towards Primrose Hill, and on this side some fair yields were obtained from small blocks of quartz. Just across the gully Taylor and party worked one of these, which was 6 inches wide and yielded on the average 6½ dwts. of gold per ton. Further on Jolly worked a block, and on the hill top Dewhurst and party sunk a shaft about 120 feet deep, and crushed stone carrying 5 dwts. of gold per ton. This was the most westerly claim.

Sixty feet to the south of this dyke another parallel line of reef has been worked, with payable results according to report. Its dip being 75° to the south and that of the dyke 60°, they probably intersect at about a depth of 210 feet or so.

Opposite Jolly and party's block a north and south reef was worked by Bishop and party to a depth of 80 feet, and yields of 14 dwts. of gold per ton were obtained. The northern extension of this line of reef intersects Earl's Reef, where the rich stone was obtained on that line.

### 17. COLEMAN'S DONKEY REEF.

Coleman's Donkey Reef is situated on the old Carisbrook road in Donkey Gully, and is 16 chains east of the Telegraph Reef line. In 1862 a small shoot was worked on the south side of the road. It was known as Monk's patch, and some rich ore was taken out, but information as to this block is scanty. The shaft is said to be 90 feet deep, but nothing can now be learnt about the stoping; one yield, reported in 1862, was over 4 ozs. per ton.

Between this and the Donkey Reef a cross reef (strike N. 40° W., dip 60° S.W.) was worked by Coleman and party. The shoot in this cross reef was short and rich, one pocket yielding 6 ozs. from a few pieces of quartz.

From the end of this cross reef the main Coleman's Donkey Reef (strike N. 15° W., dip 55° W.) was opened and worked north under the road and up the spur on the opposite side of the gully. The quartz averaged 8 inches to 1 foot wide and has been worked by a main whip shaft on the south end, where it was stoped to a depth of 120 feet. At this depth the reef split into two narrow veins diverging rapidly from one another. A winze 25 feet deep was sunk below the 120-ft. level, but failed to prove anything of value.

On the north side of the road a windlass shaft was sunk to 60 feet and connected with the south workings by a winze. There were two shoots; the south one was 20 feet long with quartz 8 inches to 1 foot thick, and yielded 2 ozs. per ton between the depths of 80 feet and 120 feet; the north shoot was also 20 feet long, and the quartz was 15 inches wide and crushings of ½ oz. per ton were obtained. Both shoo 1 pitch north.

This reef appears to be on the Flagstaff line, allowance being made for gradual faulting to the west.

It is noticeable that directly opposite Coleman's shoots and 6 chains to the west there is a large igneous boss of fairly coarse crystaline rock different to most of the igneous rocks of the district.

The following are some examples of the more recent yields taken from records in the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| | | *Coleman's Reef.* | | |
| 30th June, 1890 .. .. | 4 | 5 | 16 | Quarterly record |
| 10th August, 1897 .. .. | 5 | 5 | 18 | |
| 38th October, 1897 .. .. | 5 | 3 | 13 | |
| 15th November, 1897 .. .. | 2 | 2 | 17 | |
| 19th August, 1898 .. .. | 5 | 3 | 15 | |
| 11st August, 1899 .. .. | 6 | 3 | 10 | |
| 21st March, 1900 .. .. | 4 | 3 | 1 | Quarterly record |
| 21st March, 1901 .. .. | 3 | 4 | 3 | .. .. |
| 30th June, 1901 .. .. | 3 | 4 | 3 | .. .. |
| 26th June, 1902 .. .. | 7 | 7 | 6 | |
| 22nd December, 1902 .. .. | 2 | 1 | 11 | |
| Coleman and Son's Donkey Reef .. | 62 | 41 | 18 | (Bristol Hill Battery) |
| | | *Monk's.* | | |
| 2nd January, 1862 .. .. | 9 | 38 | 0 | |

### 18. Harvey's Reef, Havelock.

Harvey's Reef was found at Waverly Gully, Havelock, in 1906. It lies directly on the wall of a large lamprophyre dyke (Fig. 19) striking N. 18° W., and dipping 60° to 70° W. across the strata which dip east. The quartz is vitreous and occurs as usual in blocks on both walls.

Between the Timor–Havelock road and Waverly Gully quartz occurs, first on the hanging wall of the dyke, where the stone carried ½ oz. of gold per ton; and then (in Harvey's workings) on the footwall of the dyke, where it carried over 1 oz. per ton.

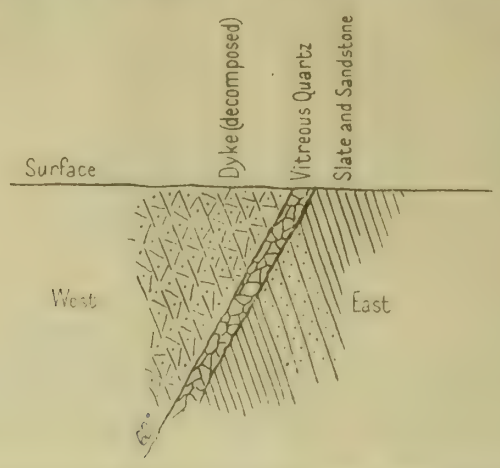



Fig. 19. Reef on footwall of dyke, Harvey's Reef. Scale 10 feet to 1 inch.

The deepest shaft, which is 60 feet, proved the dyke to be 18 feet wide.

The block worked was from 10 inches to over 1 foot in width, and averaged 1 foot where payable. It pitched south and was stoped for a length of 45 feet, and yields of over 1 oz. of gold per ton were obtained, the best being 11 tons for 16 ozs. 16 dwts.

The shoot cut out at about 60 feet, but considering the structure of this type of reef, there should yet be room for prospecting for other quartz blocks on both walls.

### 19. Frederick Line.

#### (Splitter's and Frederick Reefs.)

The Frederick line of reef crosses the Maryborough–Castlemaine railway line about a mile east of the township at the source of the several auriferous alluvial leads running into Dead Horse Gully.

Situated in the eastern dyke belt, it follows one of the main lamprophyre dykes. On the north side of the railway line the dyke rock formed the footwall to the reef, which was here known as Splitter's Reef. (Figs. 20 and 21.) South of the railway the quartz blocks were close to and on the dyke rock, which formed the hanging wall to the reef; here it was called the Frederick Reef.

#### *Splitter's Reef.*

This reef strikes N. 18° W., and dips 45° to 60° westward, cutting the Ordovician slates and sandstones both in strike and dip; the beds strike N. 12° W., and dip 85° to the west.

The quartz has been worked in places along the surface for about 300 feet, but to no great depth except on the north end, where a whim shaft has been sunk to 265 feet.

Coleman's block opposite the whim shaft was the best, and is reported to have been 50 feet long and to have been stoped from the surface to a depth of 215 feet. The main block averaged about 1 foot in width and carried ½ oz. to well over 1 oz. per ton in places. Besides the main dyke reef, the slates on the western side of the reef were intersected by quartz spurs, and these were payable in places, as is shown by such records as the following:—2nd February, 1862. Crushing 5 dwt. per ton, 6 feet wide, and at a depth of 55 feet from the surface.

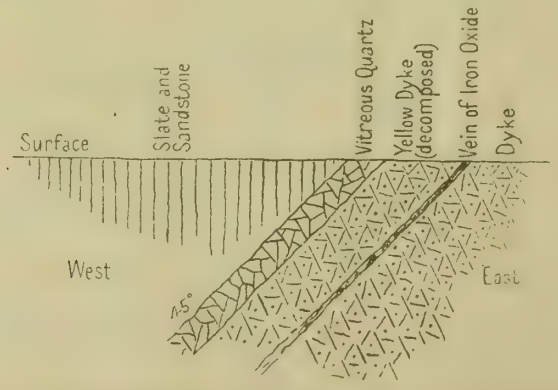



Fig. 20. Reef on hanging wall of dyke, Splitter's Reef. Scale 10 feet to 1 inch.

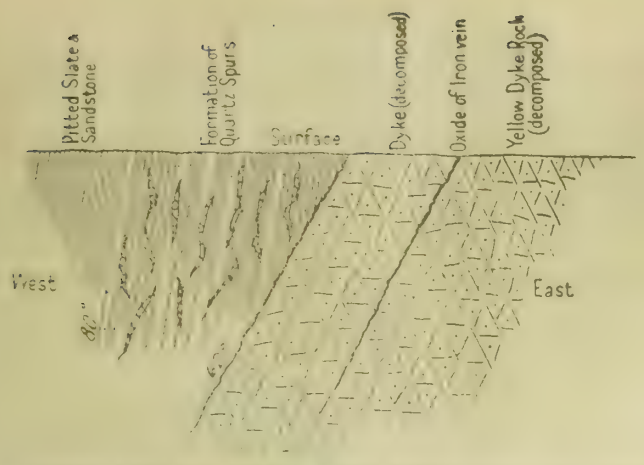



Fig. 21. Auriferous quartz spurs adjoining a dyke, Splitter's Reef. Scale 10 feet to 1 inch.

Mr. A. Cox, who worked in this mine, states that a blank of 50 feet occurred between Coleman's block and the next to the south, which was smaller and only worth 4½ dwts. to 12 dwts. per ton. Further to the south, a second blank of 20 feet was passed through, and then a third small block of quartz was discovered, yielding 9 dwts. of gold per ton. All these quartz blocks were on the western wall of the lamprophyre dyke, and point to a series of auriferous blocks extending south under the railway line towards the Frederick mine.

Water level is 200 feet from the surface, and the deepest stopes are at 215 feet on Coleman's block. At the deepest workings, 265 feet, a crosscut east met the reef at 30 feet in from the shaft, and a drive was extended southward along the reef for 150 feet without proving anything payable. The appliances used could not cope with the water. In the shallow workings the lamprophyre dyke is seen as a pale yellow to brown rock, and where the reef was best the dyke deepened in colour and showed pink and red tints with streaks of iron oxide.

The dyke is 6 feet wide and generally carries the quartz on the western wall at Splitter's, and on both walls further south at the Frederick mine. In one exposure there is 6 inches of quartz on both walls of the dyke (Fig. 22), thus showing that the blocks may occur on either wall.

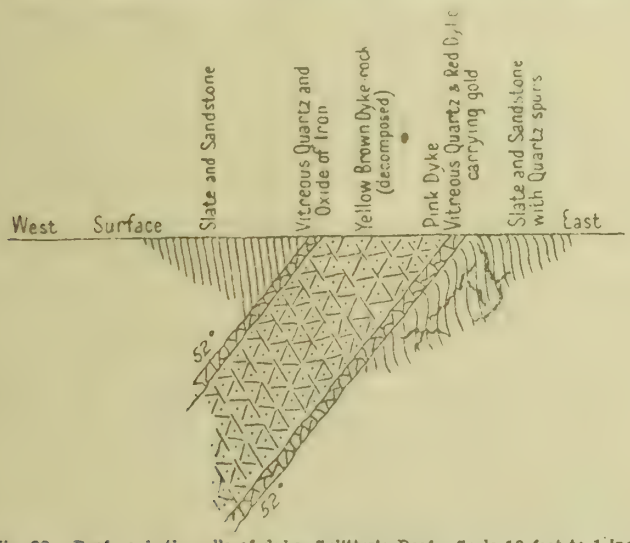



Fig. 22. Reef on both walls of dyke, Splitter's Reef. Scale 10 feet to 1 inch.

The following yields are taken from the *Maryborough Advertiser;* they comprise only a few of the Splitter's Reef crushings, but they are authentic :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 2nd January, 1862 .. .. | going 5 dwt. per ton | | 6 feet thick at 55 feet deep. Apparently from the reef and adjacent spurs |
| 13th May, 1872 .. .. | 34 | 14 0 | Coleman's block |
| 5th August, 1872 .. .. | 17 | 8 0 | ,, |
| 23rd September, 1872 .. .. | 13 | 3 18 | ,, |
| 30th September, 1872 .. .. | 6 | 2 0 | ,, |
| 31st March, 1873 .. .. | 20 | 7 7 | ,, |
| 23rd June, 1873 .. .. | 12 | 3 12 | ,, |
| 25th August, 1873 .. .. | 9 | 10 12 | ,, |
| 21st July, 1873 .. .. | 10 | 2 2 | ,, |
| 18th June, 1894 .. .. | 17 | 6 3 | Splitter's Reef |
| 22nd July, 1894 .. .. | 20 | 10 4 | ,, |
| 26th August, 1894 .. .. | 39 | 81 4 | ,, |
| 8th July, 1894 .. .. .. | 12 | 4 12 | ,, |

### *Frederick Reef.*

This reef is on the Frederick–Splitter's line of dyke and to the south of the railway line, and was opened in 1860. It has the same geological surroundings, strike, &c., as Splitter's Reef, with the main exception that one block was worked on the eastern wall of the lamprophyre dyke. (Fig. 23.)

Work was first carried on in 1861 by Monk and party, who stoped to a depth of 80 feet; in later years Williams and party sank a main vertical shaft to water level at 200 feet.

Monk and party worked two blocks, each about 1 ft. 6 in. thick and separated by the dyke, but that on the eastern wall disappeared at a depth, and there remained only the one on the western wall, as at Splitter's.

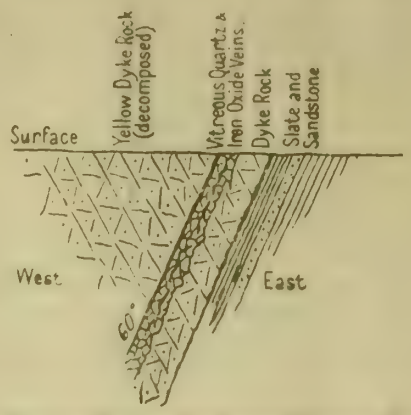



Fig. 23. Quartz reef in dyke rock and near the footwall, Frederick Reef. Scale 10 feet to 1 inch.

At 150 feet deep, the quartz was 2 feet in width in places and some of the stone yielded 2 ozs. per ton. At 200 feet, the reef changed, being spurry and payable for a width of 6 feet in quartz, slate, and sandstone, probably on account of the dyke block having pinched out.

From the 200-ft. level, the shaft followed the reef on the underlay to 270 feet, but no stoping has been done below 200 feet, although gold was obtained in the reef exposed down the underlay shaft.

Mr. Williams, who was the last to work the Frederick Reef, says the water was not very heavy, and is of opinion that there is still a good mine at the south end of the workings.

The following are some of the yields taken from the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 14th January, 1861 .. .. | 49 | 43 5 | For some time a party was mining 27 tons a week, a formation 5 feet wide yielding 8 dwt. to 21 dwts. per ton. |
| 20th March, 1861 .. .. | 118 | 88 0 | |
| 2nd January, 1862 .. .. | 180 | 121 10 | |
| 21st March, 1862 .. .. | 50 | 42 0 | |
| 15th July, 1863 .. .. | .. | .. | |

### 20. Earl's Reef.

This reef was found in 1867 by Earl and party. It is situated on Crown lands, close to the railway line and a little to the east of the engine shops, Maryborough. It is a cross reef, striking nearly east and west, with a dip south of 65°, and it appears to have two good walls cutting through slate and sandstone beds, which strike N. 13° W. and dip 84° eastward.

It runs, generally speaking, nearly parallel to a lamprophyre dyke, which occupies a main fault line traceable from the engine shops to near the Telegraph Reef. This dyke is 300 feet to the north of Earl's Reef, and its lower angle of dip would eventually cause it to cut the reef at a depth.

The quartz which has been mined averaged about 1 foot wide near the surface, but a record in the *Advertiser* of 14th May, 1866, states that the ore was up to 3 feet wide at the 120-ft. level. This apparently was a bulge in the reef, which here yielded over 8 ozs. per ton for small crushings on the east end near its elbow with a north and south reef (Bishop's).

The deepest shaft is reported to be 160 feet deep, or down to about water level, and the richer shoot is reported to be very short where last worked. It was worked by a company in 1896.

The following are some of the yields recorded in the *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 25th June, 1860 .. .. | 41 | 41 0 | |
| 26th September, 1860 .. .. | 28 | 278 0 | Amalgam |
| 14th May, 1866 .. .. | 8 | 65 10 | |
| 6th August, 1866 .. .. | 8 | 72 0 | |
| 1st October, 1866 .. .. | 20 | 21 0 | |
| 4th May, 1896 .. .. .. | 9 | 11 15 | |
| 7th September, 1896 .. .. | 8 | 6 17 | |

### 21. The Berlin Reef.

This mine is situated close to the junction of Nuggetty and Blackman's Leads, to the south-east of the township of Maryborough, and is in the Western Dyke Belt.

The workings show nothing to explain the structure, but the beds strike N. 10° W., and dip westward at an angle of 75°. The shafts appear to have been sunk to work a vein crossing the beds.

Information supplied by one of those who worked there, shows that the lode was small and the gold was found in three very short shoots.

Yields of 2 ozs. up to 11 ozs. are reported, but no tonnage is given; the crushings were probably small.

A flat nugget of gold 75 ozs. in weight was found where one of the small shoots pinched on an ironstone bar.

Very little information could be gathered about the true structure of this vein, but it appears to be on an indicator line, several of which can be found in the adjacent bedrock along Blackman's Lead, which was always noted for its nuggety gold.

Yields from *Maryborough Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 27th September, 1875 .. .. | 6¾ | 20 0 | Three men in three weeks. |
| 30th September, 1885 .. .. | 8 | 12 10 | Dewhurst |
| 30th December, 1885 .. .. | 69½ | 71 0 | |

### 22. Rob Roy Reef.

This reef is 14 chains to the east of Simpson's railway station, and was found whilst working the Happy Jack's alluvial lead. Rich yields were obtained in 1873.

It is in Shaw's Belt and away from the influence of any dyke. Its strike is N. 11° W., and its dip is 80° westward. The rocks are somewhat similar to those around Shaw's Reef, and the quartz is laminated and reported to be from a few inches up to 1 ft. 6 in. thick.

The main shaft has been sunk to a depth of 210 feet to the well, having several levels as follow :—

140-ft. level.—A crosscut east reached the reef at 10 feet, and a drive was then put out north for a distance of 132 feet.

160-ft. level.—A drive south for 80 feet exposed rich specimens from leaders.

200-ft. level.—A drive south was put in for 150 feet, and at 140 feet a rise was put up to cut the shoot on its south pitch.

Water level was about 80 feet from the surface.

Appended are a few yields from *Advertiser* :—

20th June, 1873, 10 tons for 24 ozs.

19th December, 1873, 20 tons for 71 oz. 4 dwts. (from leaders).

At 140-ft. level, yields from ½ oz. to 1 oz. per ton.

At 160-ft. level, yields of 4 ozs. per ton, and rich specimens.

### 23. Kirk's Reef, Pound Hill.

This reef is in the Western Dyke Belt, and about 1 mile north of the township, and shows typical examples of dykes with horizontal offshoots. (Fig. 24.)

The reef is a wide formation of quartz spurs, slate, &c., in a defined channel, with good walls. The strike is N. 22° W., and the dip from 85° eastward near the surface, to 70° westward in the deeper workings. The main shaft is 50 feet deep. The reef has been up to 6 feet wide and it cuts across east dipping beds.

At the surface, the formation was taken out by open cut, but as work proceeded it became necessary to sink the shaft and work in stopes which extended some distance south of the shaft.

The first yields were poor, and as low as 1½ dwt. per ton. Soon, however, a rich spur was found in the eastern wall, and this encouraged further prospecting. The yields gradually improved, though only slightly, and at between 20 feet and 30 feet deep a marked improvement occurred and the gold content rose to 7½ dwts. per ton. The reef was here 6 feet wide, and contained much white kaolinized felspar scattered amongst the quartz spurs (Fig. 24).

At the 30-ft level a 4-in. horizontal lamprophyre dyke cut across the reef formation; below this the quartz became poor once more. On further sinking, more kaolin and an improvement in gold again occurred for a few feet above a second horizontal dyke.

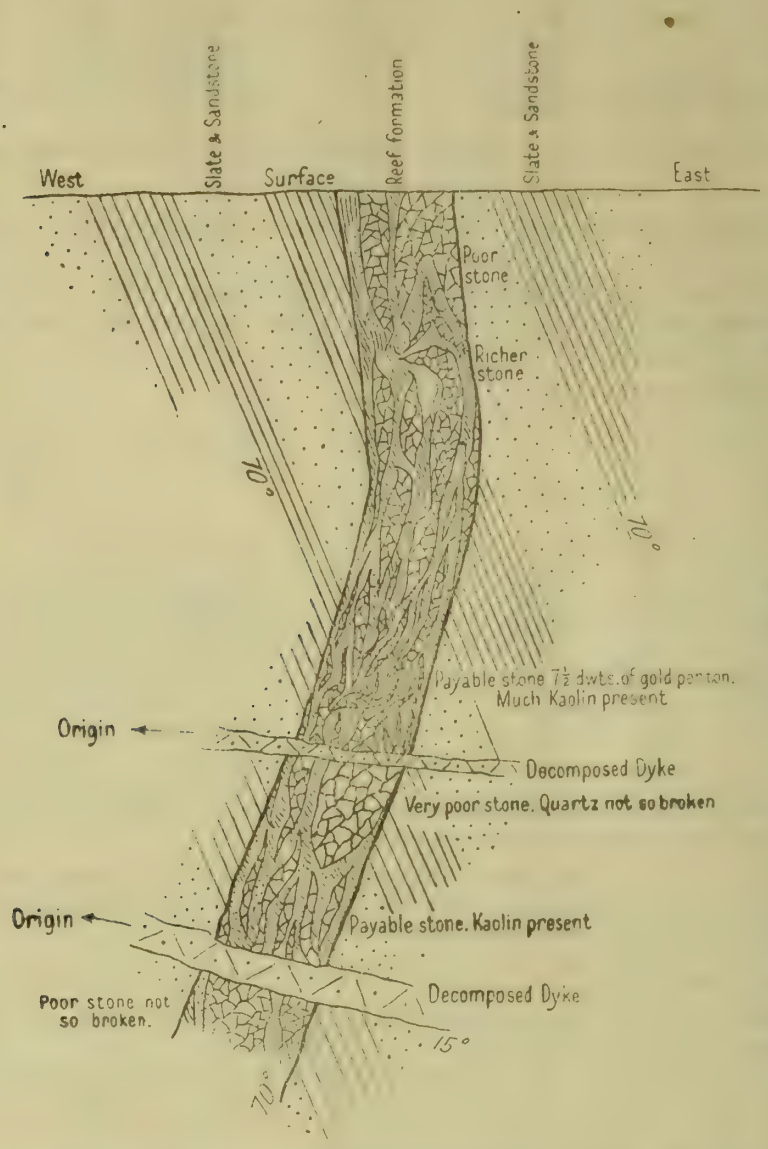



Fig. 24. Reef channel intersected by two lateral offshoots from a dyke, Kirk's Reef. Scale 10 feet to 1 inch

From this it appears that these dykes have an influence on the deposition of gold and felspar directly above them, but not below them.

Yields, although amounting only to a few pennyweights at times, were often payable, as when the 7½-dwt. stone was crushed. 630 tons was mined, and yielded 125 ozs., an average of 4 dwts. throughout.

Rowle's reef, which yielded 1 oz. per ton, was worked one chain to the west, and the Old Pound line, two chains to the west of Kirk's line, both dipping to the east, whilst Kirk's dips west.

## 24. Turton's Reef.

Turton's Reef is situated about three-quarters of a mile north-west of the Old Leviathan Reef, and close to Watson's lane, Chinaman's Flat. It was discovered whilst working some alluvial wash which branches off from the main Chinaman's Flat lead.

The reef formation is reported to be several feet in width, but the payable block was short and not rich.

The average strike, which can only be taken from the several shafts on the line, is N. 20° W., and the workings show an easterly dip. Yields of from 9 dwts. to 14 dwts. of gold per ton were obtained.

Of the several shafts, the deepest is said to be 100 feet.

It is generally supposed that this reef is on the North German line, which was so extensively worked to the south, but, as the plan shows, it is a little to the west of that line.

## 25. McCann's Reef.

McCann's Reef is north of the New Leviathan Reef, and a short distance to the west.

This line is in the Western Dyke Belt and the nearest known dyke is on the line of the New Leviathan Reef. The reef strikes N. 15° W., and dips to the westward. The quartz reef was spurry, and up to 8 feet in width. The main work on this reef was done between 1896 and 1899, and McCann's North was worked by Crameri and party in 1900.

Just to the east of McCann's North, a parallel reef up to 4 feet wide was worked by Denyer and party for yields up to 10 dwts. per ton. It dips to the east and is about in line with the North German Reef, the main workings of which lie to the north of it.

The following yields are from the *Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | *McCann's Reef.* | | |
| 25th May, 1896 .. .. | 6 | 3 8½ | |
| 22nd June, 1896 .. .. | 10 | 6 2 | |
| 17th August, 1896 .. .. | 25 | 10 9 | |
| 14th September, 1896 .. .. | 15 | 8 5 | |
| 9th November, 1896 .. .. | 35 | 19 2 | |
| 12th October, 1896 .. .. | 27 | 17 3 | |
| 14th December, 1896 .. .. | 60 | 44 12 | |
| 18th January, 1897 .. .. | 32 | 10 11 | |
| 3rd March, 1897 .. .. | 72 | 52 13 | Quarterly Report |
| 24th May, 1897 .. .. | 26 | 12 6 | |
| 28th June, 1897 .. .. | 42 | 22 1 | |
| 27th September, 1897 .. .. | 39 | 15 13 | |
| 15th November, 1897 .. .. | 28 | 9 9 | |
| 22nd November, 1897 .. .. | 24 | 6 10 | |
| 6th December, 1897 .. .. | .. | 16 14 | Copper plates |
| 31st January, 1898 .. .. | 23 | 11 10 | |
| 11th May, 1898 .. .. | 95 | 48 5 | |
| 17th June, 1898 .. .. | 56 | 29 15 | |
| 31st August, 1898 .. .. | 21 | 13 13 | |
| 31st September, 1898 .. .. | 54 | 34 6 | |
| 23rd December, 1898 .. .. | 22 | 8 4 | |
| | *McCann's North Reef.* | | |
| 30th December, 1900 .. .. | 309 | 90 15 | Crameri and party |
| 2nd March, 1903 .. .. | 15 | 13 14 | |
| 25th May, 1903 .. .. | 20 | 9 0 | |

## 26. Old Victoria Reef.

The Old Victoria lies about a quarter of a mile to the south of the Maryborough Leviathan Co.'s main shaft. The reef strikes N. 20° W., and dips 70° to the west, cutting eastern dipping beds. It is similar to the New Leviathan line, consisting of large formations of quartz spurs and veins. The reef was cut by a dyke in a fault which moved the payable stone slightly to the east, where it was worked by Baker and Barclay in recent years.

The appended yields are from the *Advertiser* :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 19th September, 1862 .. .. | 16½ | 7 8 | Jones and party |
| 14th August, 1863 .. .. | 30 | 10 10 | |
| 25th March, 1867 .. .. | 63 | 22 1 | |
| 7th July, 1867 .. .. .. | 15 | 3 0 | Booth and party |
| 22nd July, 1867 .. .. | 130 | 26 0 | Fisher and party |
| 12th August, 1867 .. .. | 60 | 15 0 | |
| 26th August, 1867 .. .. | 25 | 12 0 | |
| 9th September, 1867 .. .. | 40 | 2 10 | |
| 16th September, 1867 .. .. | 151 | 28 0 | |
| 30th September, 1867 .. .. | 41 | 5 2 | |
| 21st October, 1867 .. .. | 33 | 5 0 | |
| 28th October, 1867 .. .. | 50 | 6 5 | |
| 18th November, 1867 .. .. | 27 | 4 14 | |
| 16th December, 1867 .. .. | 17 | 3 8 | |
| 26th December, 1870 .. .. | 74 | 14 6 | |
| 26th November, 1906 .. .. | 6 | 1 4 | Baker and party |
| 31st December, 1906 .. .. | 14 | 6 12 | ,, |
| 21st May, 1907 .. .. .. | 11 | 4 18 | ,, |
| 31st October, 1908 .. .. | 3 | 4 10 | ,, |
| 1906–1908 .. .. .. | 113 | 74 9 | Baker and party ; crushed at Bristol Hill Battery |

### 27. North British Reef.

The North British Reef is situated east of the Leviathan Reef in the Western Dyke Belt, and is one of the eastern lines along Chinaman's Flat. The formation strikes N. 15° W., and dips 75° to the westward, cutting green pitted slates and grey to pink sandstones, which dip 65° eastward.

The hanging wall is regular, but the footwall spurry, leaders coming in with a general westerly to nearly horizontal dip.

The quartz is semi-vitreous, with iron oxide on the fracture planes, and kaolin.

The Alison, a small reef on the southern extension of this line, lies close by to the west, and dips towards the North British line.

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | *North British Reef.* | | |
| 26th September, 1862 .. .. | 40 | 18 0 | |
| 15th September, 1863 .. .. | 265 | 92 15 | |
| 27th April, 1864 .. .. | 100 | 100 0 | Thomson and party |
| 9th February, 1867 .. .. | 26 | 35 0 | |
| 22nd April, 1867 .. .. | 13 | 34 15 | Darling party |
| 4th November, 1867 .. .. | 10 | 1 10 | |
| 30th December, 1867 .. .. | 58 | 11 10 | |
| 30th September, 1891 .. .. | 45 | 34 17 | |
| 10th July, 1893 .. .. | 20 | 9 13 | |
| 31st December, 1893 .. .. | 58 | 18 18 | Quarterly return |
| 22nd January, 1894 .. .. | 16 | 6 8 | |
| 30th September, 1894 .. .. | 84 | 33 9 | Quarterly return |
| 31st December, 1897 .. .. | 9 | 8 9 | |
| 31st January, 1898 .. .. | 8 | 3 8 | |
| 24th October, 1898 .. .. | 10 | 10 13 | |
| 21st August, 1899 .. .. | 10 | 8 4 | Quarterly return |
| 14th May, 1900 .. .. | 14 | 14 3 | |
| 25th July, 1900 .. .. | 13 | 11 17 | |
| 24th September, 1900 .. .. | 8 | 5 9 | |
| 30th September, 1900 .. .. | 21 | 17 5 | |
| 29th October, 1900 .. .. | 5 | 4 0 | |
| | *Alison Reef.* | | |
| 30th June, 1892 .. .. | 6 | 1 4 | |
| 3rd April, 1896 .. .. .. | 7 | 14 0 | |
| 8th April, 1896 .. .. .. | 6 | 14 0 | |

### 28. Denyer's Middle Reef.

This reef is on the line of the small laminated reef known as the Middle Reef, which lies between the Old and New Leviathan Reefs throughout Chinaman's Flat, and is a sure guide, when found, to the position of these two lines. It strikes N. 15° W., and dips eastward. The quartz is wider than is usual along the Middle Reef, and sometimes yielded over 1 oz. per ton. The shaft, which was worked with a whip, is sunk about 100 feet, nearly to water level.

The following reefs are parallel to one another at this locality:—Old Leviathan on the east, then Denyer's, Perseverance, and North German on the west. The lamprophyre dyke along the Old Leviathan line passes close to the reef.

The appended yields are from the *Advertiser*:—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| 25th September, 1893 .. .. | 28 | 14 8 | |
| 16th October, 1893 .. .. | 16 | 4 10 | |
| 23rd October, 1893 .. .. | 47 | 18 0 | |
| 17th December, 1894 .. .. | 40 | 19 0 | |
| 29th December, 1894 .. .. | 30 | 33 8 | |
| 20th May, 1895 .. .. | 51 | 15 5 | |
| 1st July, 1895 .. .. .. | 42 | 9 4 | |
| 2nd September, 1895 .. .. | 57 | 20 0 | |
| 20th May, 1895 .. .. | 51 | 15 5 | |
| 1st July, 1895 .. .. .. | 42 | 9 4 | |
| 2nd September, 1895 .. .. | 57 | 20 0 | |
| 20th January, 1896 .. .. | 20 | 8 1 | |
| 20th September, 1897 .. .. | 10 | 5 8 | |
| 22nd November, 1897 .. .. | 15 | 6 9 | |
| 31st December, 1897 .. .. | 14 | 6 5 | |
| 7th March, 1898 .. .. | 8 | 6 6 | |
| 18th July, 1898 .. .. | 8 | 4 6 | |

### 29. Hastings Perseverance Reef.

This reef is situated to the north of the Old Leviathan Reef and a little west of the Chow Chow Reef, in the Western Dyke Belt, the nearest dyke being about 2 chains to the east. The deepest shaft is sunk 120 feet, or just below water level, which is at 106 feet from the surface.

The strike is a few degrees west of north, and the dip 85° to the eastward.

The reef consists of spurry white quartz with furruginous fracture planes. It has fairly regular slate and sandstone walls, and was 2 feet to 4 feet thick in the south end, where quartz yielding nearly 1 oz. of gold per ton was mined. In the north end it was much wider, but poorer in gold. The shoot is said to pitch north at the north end, but the richest stone at the south end appeared to those who worked in the mine to pitch south.

The yields from the north end are reported as 10 dwts. per ton, but no length of shoot is stated; and in the southern workings, where the better stone came from, such yields are reported as 224 tons crushed for 212 ozs. of gold.

### 30. North German Reef.

(Including Lancashire and Yorkshire Claim.)

This reef is close to Cundy's old battery site, and is north of the Yorkshire and Lancashire, which is on the southern extension of the line.

The strike of the reef is N. 15° W., and the dip is eastward. The reef was found under rich alluvial ground, which yielded in places up to 50 ozs. of gold per load in the early days. It consisted of spurs and large quartz veins in a well-defined channel, somewhat like the New Leviathan Reef.

The deepest shaft is the North German, sunk to 250 feet.

In places along the reef, ore was taken out for a width of 12 feet in the Yorkshire and Lancashire claim, and yields of 1 oz. per ton at times obtained.

The Green Isle claim was between the North German and the Lancashire and Yorkshire, and was worked by Cummins and party, in 1867, for yields of over 1 oz. per ton.

The Lancashire and Yorkshire claim to the south of the Green Isle, worked a wide payable reef, and according to report, there is a reef 2 feet wide with 7-dwt. stone in it at water level (106 feet).

Fisher and Mayman worked a more northern claim for poorer yields. This was the extreme north workings on the line and just past the Four Snobs whim claim, which is directly north of the main North German shaft.

The appended yields from several claims will give a general idea of the values along the line. They are authentic records taken from the *Maryborough Advertiser*:—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| *North German Line of Reef.* | | | |
| 8th October, 1860 .. .. | 5 | 4 10 | 4 feet wide. N. German, Lancashire and Yorkshire claim |
| 28th August, 1865 .. .. | 160 | 101 0 | |
| 18th September, 1865 .. .. | 191 | 127 0 | ,, ,, ,, ,, |
| 25th October, 1865 .. .. | 300 | 146 5 | ,, ,, ,, ,, |
| 1st December, 1865 .. .. | 34 | 8 10 | No. 2 claim. ,, ,, ,, ,, |
| 11th March, 1866 .. .. | 77 | 55 10 | No. 5 claim |
| 11th April, 1866 .. .. | .. | 20 0 | No. 1 claim |
| 18th June, 1866 .. .. | 200 | 120 0 | No. 3 claim |
| 18th August, 1866 .. .. | 43 | 40 0 | ,, |
| 17th August, 1866 .. .. | 210 | 99 0 | |
| 20th August, 1866 .. .. | 111 | 28 0 | No. 2 claim |
| 8th October, 1866 .. .. | 250 | 50 0 | No. 4 claim |
| 29th October, 1866 .. .. | 74 | 24 1 | |
| 26th December, 1866 .. .. | 188 | 94 0 | |
| 6th February, 1867 .. .. | 212 | 163 0 | Cummins' Green Isle claim |
| 11th March, 1867 .. .. | 80 | 65 10 | |
| 22nd April, 1867 .. .. | 329 | 351 0 | Cummins' claim |
| 24th June, 1867 .. .. | 500 | 74 0 | Fisher's claim |
| 8th July, 1867 .. .. .. | 140 | 49 0 | Cummins' claim |
| 8th July, 1867 .. .. .. | 70 | 14 0 | |
| 31st July, 1867 .. .. | 42 | 11 0 | Clancy and party |
| 9th September, 1867 .. .. | 43 | 2 5 | ,, |
| 16th September, 1867 .. .. | 34 | 11 1 | Wheeler and party |
| 23rd September, 1867 .. .. | 10 | 0 11 | Hicks and party |
| 23rd December, 1867 .. .. | 142 | 45 0 | |
| 23rd December, 1867 .. .. | 24 | 5 0 | |
| 2nd March, 1868 .. .. | 91 | 13 13 | |
| 25th March, 1868 .. .. | 64 | 17 12 | |
| 25th March, 1868 .. .. | 136 | 30 12 | |
| 21st September, 1868 .. .. | 11 | 2 4 | Wangman's claim |
| 28th September, 1868 .. .. | 62 | 12 18 | |
| 26th September, 1870 .. .. | 570 | 373 0 | N. German workings |
| 23rd December, 1878 .. .. | 28 | 21 12 | ,, ,, |
| 30th September, 1879 .. .. | 39 | 11 0 | ,, ,, |

### 31. Chow Chow Reef.

The Chow Chow Reef is north of the Old Leviathan Reef and somewhat similar to it, being on the same line and associated with the same dyke.

The strike is N. 15° W. at the southern end of the reef, but at its northern end it is sharply deflected in a more northerly direction, the beds showing much twisting at the surface. The beds and the reef have the same strike; the beds dip east and the reef probably dips west, but this is not certain as the workings are now inaccessible.

Very little authentic information was obtained about this reef, which was worked in the sixties. The greatest depth attained is doubtful, but no mining was done below water-level. In 1863 the Chow Chow No. 1 claim was 60 feet deep, and yielded over 1½ ozs. to the ton. As in the case of the Old Leviathan, crystals of gold were found in this mine.

Some of the recorded yields are—

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | Tons. | ozs. | dwts. | |
| 27th July, 1863 .. .. | 7 | 11 | 5 | No. 1 claim |
| July, 1863 .. .. .. | 16 | 4 | 10 | No. 2 claim |
| 18th March, 1867 .. .. | 94 | 35 | 0 | Feighan and party |
| March, 1867 .. .. .. | 86 | 8 | 0 | ,, |
| 25th March, 1867 .. .. | 211 | 22 | 7 | White and party |
| 22nd April, 1867 .. .. | 9 | 1 | 5 | Barg and party |
| 29th April, 1867 .. .. | 68 | 11 | 10 | White and party |

### 32. Arrah-na-Pogue Reef.

The Arrah-na-Pogue Reef is on the line of the Old Leviathan Reef, but a mile away on the southern extension of that line. The reef strikes N. 20° W., and dips westward, cutting pitted slate and ferruginous beds which dip 80° to the east. It is spurry, with flat veins very similar to the Old Leviathan formations.

A coarse lamprophyre dyke is associated with the reef, probably the same as the Chow Chow–Leviathan line.

The main shaft was 150 feet deep in 1867, the reef having then been worked a little below water-level.

The yields show that on the whole it has been a patchy formation; some of the ore yielded over 2 ozs. of gold per ton, and patches of specimens occurred, one of 9 ozs. in weight being found south of the main shaft.

The following yields are from the *Advertiser*:—

| Date. | Ore Crushed. | Gold Recovered. | | Remarks. |
|---|---|---|---|---|
| | tons. | oz. | dwts. | |
| 4th February, 1867 .. .. | 27 | 51 | 0 | |
| 22nd March, 1867 .. .. | 30 | 63 | 0 | |
| 3rd June, 1867 .. .. .. | 26 | 52 | 8 | |
| 12th June, 1867 .. .. | .. | 11 | 0 | Specimens |
| 5th August, 1867 .. .. | 41 | 37 | 0 | |
| 11th September, 1867 .. .. | 18 | 18 | 8 | |
| 26th October, 1867 .. .. | 34 | 22 | 4 | |
| 12th December, 1867 .. .. | 12 | 16 | 19 | Shaft 150 feet deep |
| 23rd December, 1867 .. .. | 13 | 16 | 0 | |
| 31st March, 1897 .. .. | 13 | 11 | 0 | Heckler and party |
| 26th June, 1897 .. .. | 15 | 2 | 9 | |
| 30th June, 1897 .. .. | 60 | 15 | 9 | |
| 25th July, 1897 .. .. | | 1 | 14 | |
| 7th August, 1897 .. .. | [illegible] | 3 | 12 | |
| 17th September, 1897 .. .. | 12 | 3 | 17 | |
| 26th September, 1897 .. .. | 18 | 11 | 1 | |
| 1st November, 1897 .. .. | 16 | 9 | 18 | |
| 6th December, 1897 .. .. | 24 | 13 | 13 | |
| 26th September, 1898 .. .. | 14 | 9 | 0 | |
| 24th October, 1898 .. .. | 14 | 5 | 5 | |
| 3rd March, 1899 .. .. | 23 | 4 | 1 | |
| 8th September, 1899 .. .. | 15 | 3 | 11 | |
| 16th October, 1899 .. .. | 13 | 2 | 17 | |
| 27th August, 1899 .. .. | 10 | 2 | 14 | |
| 13th December, 1899 .. .. | 20 | 4 | 8 | |
| 31st March, 1900 .. .. | 13 | 2 | 9 | |
| 18th June, 1900 .. .. | 14 | 1 | 13 | |
| 30th January, 1901 .. .. | 50 | 7 | 3 | |

The reefs dealt with in this Quarter Sheet Survey do not include many of the important reefs south of Maryborough, such as Trompf's, Portuguese, Cambrian, Princess Royal, and the Mosquito–Craigie Reefs, too numerous to mention, but a number of them will be included in the Amherst–Talbot Survey, now in hand.

## 33. Other Reefs Worked.

(Yields appended.)

The following reefs are of some importance, and in a few cases have been worked to a fair depth. Many of them are on lines already reported on. A few yields will be recorded, which may be of some value, as they are correct records taken from the *Advertiser* publications.

| Name of Reef. | Locality, &c. |
|---|---|
| 1. Morgan's .. | In the East Maryborough township; very rich, but small. |
| 2. Pope Pius .. | At the Convent Hill, township of Maryborough. |
| 3. New Victoria .. | North of North British Reef, Chinamen's Flat. |
| 4. Cymbeline .. | Just south of Old Leviathan Reef. |
| 5. Little Yorkshire .. | Just east of North British Reef; very small reef. |
| 6. Cross Reef .. | Near McCann's Reef; no record of workings available. |
| 7. United Kingdom .. | North of New Telegraph Reef, White Hills; and on same line |
| 8. Ant Reef .. | Small rich vein cutting across the strike of the strata. |
| 9. Crown and Kettle | Moonlight Lead; in western indicator series of beds. |
| 10. Camp Oven .. | Moonlight Lead, Balaclava; in western indicator series of beds. |
| 11. Clements .. | Adelaide Lead, north of State School and in middle indicator series of beds. |
| 12. Welshman's .. | Waterloo East; small reef in hard beds. |
| 13. Eldorado .. | In Griffith's Gully north, near Warton's allotment. |
| 14. Schicer .. | South of and near Flagstaff Reef. |
| 15. Koochadooh .. | South of Flagstaff and west of Pigeon Reef. |
| 16. Pigeon .. | South of Flagstaff Reef. |
| 17. Harpers .. | On Shaw's line of reef, to the north. |
| 18. Happy Tommy .. | Timor East; reef and dyke at an angle. |
| 19. Ellis's Reef .. | Schicer Gully, Maryborough East; dyke and reef in extensive fault line. |
| 20. Cemetery Reef .. | East of Maryborough cemetery; dyke and reef |

A table of yields from these reefs will now be given in the same order in which they are listed above :—

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| **1. *Morgan's Reef.*** | | | |
| 5th November, 1866 .. .. | 13 | 45 0 | |
| 6th February, 1867 .. .. | 37 | 43 0 | Conway |
| 8th March, 1867 .. .. | 16 | 131 4 | |
| **2. *Pope Pius Reef.*** | | | |
| 29th July, 1864 ... ... | 6 | 15 12 | |
| **3. *New Victoria Reef.*** | | | |
| 30th October, 1876 .. .. | 37 | 118 14 | Carlyon |
| 3rd April, 1894 .. .. .. | 12 | 7 10 | Jenkins |
| 7th May, 1894 .. .. | 18 | 11 10 | ,, |
| 11th June, 1894 .. .. | 21 | 5 11 | ,, |
| 31st January, 1898 .. .. | 11 | 3 17 | Walker |
| 16th October, 1899 .. .. | 15 | 3 7 | |
| 31st December, 1899 .. .. | 16 | 4 11 | |
| 31st March, 1900 .. .. | 25 | 9 14 | |
| 2nd April, 1900 .. .. | 34 | 9 15 | |
| 31st June, 1900 .. .. | 15 | 1 12 | |
| **4. *Cymbeline Reef.*** | | | |
| 31st March, 1882 .. .. | 65 | 43 0 | |
| 24th May, 1882 .. .. | 75 | 27 0 | |
| 21st July, 1882 .. .. | 60 | 7 5 | |
| 24th July, 1882 .. .. | 26 | 11 13 | |
| 30th December, 1882 .. .. | 79 | 13 9 | 130 feet. Quarterly return |
| 19th March, 1883 .. .. | 40 | 4 10 | |
| **5. *Little Yorkshire Reef.*** | | | |
| 8th May, 1867 .. .. .. | 9 | 12 0 | |
| **6. *Cross Reef (Denyer).*** | | | |
| 1860 .. .. .. ... | .. | | 18 to 25 dwt. per ton<br>7 dwt. stone now at water level |
| **7. *United Kingdom Reef.*** | | | |
| 30th September, 1899 .. .. | 11 | 5 8 | |
| 10th March, 1873 .. .. | 9 | 2 11 | |
| 1873 .. .. .. .. | 690 | 138 0 | Total |
| **8. *Ant Reef Reef.*** | | | |
| 13th November, 1861 .. .. | 12 | 34 10 | |
| 1900 ... .. .. .. | [illegible] | 9 9 | Harvey |
| | 605 | 892 8 | Wilson & Co., crushed at Cambrian Battery |

YIELDS—*continued.*

| Date. | Ore Crushed. | Gold Recovered. | Remarks. |
|---|---|---|---|
| | Tons. | ozs. dwts. | |
| | 9. *Crown and Kettle Reef.* | | |
| 27th October, 1862 .. .. | 10 | 9 10 | Reef 4 feet; 30 feet deep |
| 17th May, 1863 .. .. | 12 | 13 0 | |
| 13th June, 1892 .. .. | 13 | 20 0 | |
| 8th August, 1892 .. .. | 44 | 58 13 | |
| 30th September, 1892 .. .. | 49 | 36 3 | |
| | 10. *Camp Oven Reef.* | | |
| 18th January, 1860 .. .. | .. | 13 0 | 1 bucket |
| | 11. *Clement's Reef.* | | |
| 11th January, 1860 .. .. | 12 | 56 0 | |
| 30th December, 1885 .. .. | 76 | 46 11 | |
| 11th June, 1894 .. .. | 2 | 12 10 | |
| 30th September, 1896 .. .. | 7 | 3 13 | |
| | 12. *Welshman's Reef.* | | |
| 17th October, 1859 .. .. | 48 | 107 6 | |
| 30th January, 1860 .. .. | 14 | 7 0 | |
| | 13. *Eldorado Reef.* | | |
| 14th October, 1887 .. .. | 5 | 4 12 | Barkley |
| 8th September, 1899 .. .. | 7 | 3 10 | Bowles and Diamond |
| 16th October, 1899 .. .. | 16 | 6 13 | ,, ,, |
| | 14. *Schicer Reef.* | | |
| 28th January, 1859 .. .. | 14 | 11 6 | |
| 1st March, 1859 .. .. | 6 | 12 0 | |
| 6th June, 1859 .. .. .. | 18 | 14 0 | |
| 17th October, 1859 .. .. | 8 | 10 0 | |
| 16th November, 1859 .. .. | 33 | 29 14 | |
| 31st January, 1860 .. .. | 22 | 27 10 | |
| 3rd October, 1860 .. .. | 9 | 9 0 | 80 feet deep |
| 17th October, 1860 .. .. | 1 | 10 0 | |
| | 15. *Koochadooh Reef.* | | |
| Early days .. .. .. | .. | 12 0 | From 10 lbs. of specimens. Later crushing 1½ oz. to the ton. |
| | 16. *Pigeon Reef.* | | |
| Early days .. .. .. | 6 | 21 0 | Average 1 oz. per ton. Coleman |
| | 17. *Harper's Reef.* | | |
| 13th January, 1860 .. .. | .. | .. | 11 oz. per ton |
| 21st March, 1860 .. .. | 10 | 9 0 | |
| | 18. *Happy Tommy Reef.* | | |
| | | | 1 oz. per ton reported |
| | 19. *Ellis Reef, Schicer Gully.* | | |
| 1st May, 1893 .. .. .. | 4 | 3 6 | |
| 11th July, 1893 .. .. | 1 | 4 0 | |
| 9th October, 1893 .. .. | 6 | 3 2 | |
| 10th June, 1895 .. .. | 4 | 7 2 | |
| 5th August, 1895 .. .. | 2 | 2 3 | |
| 30th September, 1895 .. .. | 6 | 31 10 | |
| 8rd February, 1896 .. .. | 19 | 6 18 | |
| 31st February, 1896 .. .. | 12 | 6 10 | |
| | 20. *Cemetery Reef.* | | |
| 11th February, 1867 .. .. | 44 | 30 0 | Keilor s |
| 3th March, 1867 .. .. | 16 | 3 4 | |
| 3th April, 1867 .. .. .. | 1½ | 4 10 | |
| 2nd September, 1867 .. .. | 1½ | 2 4 | |
| 23rd September, 1867 .. .. | 5 | 6 14 | |
| 8th March, 1869 .. .. | 17½ | 20 0 | |
| 28th June, 1869 .. .. | 46 | 31 0 | Smeltzer |
| 2nd August, 1869 .. .. | 11½ | 7 10 | |
| 6th June, 1870 .. .. .. | 24 | 17 0 | |
| 25th May, 1870 .. .. | 21 | 15 0 | |
| 5th September, 1870 .. .. | 3 | 6 0 | |
| 17th October, 1870 .. .. | 23 | 17 10 | |
| 5th December, 1870 .. .. | 25 | 36 7 | |
| 13th February, 1871 .. .. | 31 | 29 0 | |
| 3rd April, 1871 .. .. .. | 21 | 26 0 | |
| 10th July, 1871 .. .. | 39 | 38 4 | |
| 11th September, 1871 .. .. | 38 | 9 0 | |
| 10th June, 1872 .. .. | 60 | 48 0 | |
| 29th July, 1872 .. .. | 68 | 61 0 | |
| 11th November, 1872 .. .. | 60 | 28 0 | |
| 1907 .. .. .. .. | .. | .. | |

## VI. INDICATOR MINING.

### Main Indicator Belt.—The Eastern Series.

#### *Smart and Swain's Indicator, Waterloo.*

(Plate V.)

This indicator is situated in the eastern series of the Main Indicator Belt, at the head of two small tributary leads on the western side of Waterloo Lead, parish of Maryborough.

Here there are two parallel lines 18 feet apart, crossed by the same cross fissures. The western line (Smart's) is the richer and more worked. It is a bed of green pitted slate carrying a laminated metasomatic quartz vein 2 inches in width, which has formed on planes of movement parallel to the bedding, near the east side of the slate. One inch to the west of the laminated vein there is a seam or track of decomposed pyrites, opposite which the coarsest gold was obtained in the cross fissures.

The main cross fissure varied from a gritty floor up to a ½-inch vein of semi-vitreous quartz. It dips 40° to the south, besides having a slight inclination to the east.

According to the original prospectors, a yield of 20 ozs. was won, and then the cross vein made as a floor with poor prospects. Adams and party subsequently took up the claim, and after following a poor floor, opened up a rich patch where the quartz made again, thus showing that when a trail of gold can be obtained the cross fissures are worth following. Adams and party are reported to have taken out £400 worth of gold from the continuation of this vein, which they followed to water level.

The other line of indicator was not so good, but generally similar in character, except that the laminated vein carried the pyrites disseminated in it and was well inside the slate bed.

On these two lines five cross fissures were followed, some of which cut both indicators, making eight small shoots in a few chains.

Of the other cross fissures which have been opened along these indicators, White and party's, to the south of Smart's (or Adam's) shaft, was fairly payable, according to report. Kennedy and party worked the best of the northern claims, but it was nothing like so rich as Adam's claim. All cross veins dip south 35° to 40°. In that portion of the indicator where Adams, Smart, and White and party worked, there was more decomposed pyrites and iron staining than in the northern claims; this fact may have had some bearing on the cross fissures to the south being the richer.

Further north, but close to the strike of the western dipping lines, Martin and party opened an indicator dipping east, and from a cross fissure dipping south they obtained 6 ozs. of gold; but on the whole the cross vein was not payable.

This reversal in dip indicates an anticlinal fold close to the western dipping lines, and so the two parallel indicator lines should be found in strata dipping east directly to the east of Smart's lines. The known cross fissures might extend to and cut them also.

Both varieties of indicator gold were found on this Waterloo series (p. 15).

#### *Swain's Indicator, Inkerman.*

(Plate VI.)

Swain's Indicator is situated just to the north of Johnson's allotment, Inkerman Lead, in the eastern series of the Main Indicator Belt. (Plate 1.) This line was found in August, 1904, by I. Swain, who first discovered 10 dwts. of specimen gold in an old alluvial heap, and subseqently traced it to a small cross fissure cutting an indicator bed 9 feet below the surface and under the old alluvial workings.

The indicator consists of a 6-inch metasomatic quartz vein, with 6 inches of pale-green to white slate on the west and 1 foot of similar slate on the east, making in all an indicator bed 2 feet in width. Its strike is N. 20° W., and as far as opened up, it has been vertical. The metasomatic quartz vein is saccharoidal and laminated, with the usual slickensides, and parted by green pitted slate containing disseminated pyrites.

The cross fissure is very narrow; in places it is only a gritty ironstone and quartz track, and where widest it carries only 1 inch of quartz. It dips 28° to the south, besides inclining a little to the east. The gold in the cross fissure was followed for over 80 feet, when a fault cut the strata, moving the southern continuation of the beds 16 feet to the east. The indicator was again found, but not the auriferous cross vein. The work was carried on from four shafts varying in depth from 9 feet to 40 feet.

The yield from 6 tons, the result of five months' work for two men, was 75 ozs. Five inches of slate, laminated vein, &c., was taken out above and below the vein, so the actual tonnage of auriferous quartz was very small and the yield rich. The gold occurred directly opposite the laminated quartz vein, and included both fine and coarse samples, with specimens of 5 dwts., 10 dwts., and one nuggety piece of 7 ozs., obtained north of the 30-ft. shaft. The cross fissure here occurs at a conveniently low angle and others may be found below equally as good.

#### *Alma–Slaughter Yard Hill Indicators.*

(Plate VII.)

These indicators occur on the northern extension of the Main Indicator Belt, in allotments 20 and 23, parish of Maryborough, and at Slaughter Yard Hill, east of Alma.

They comprise two lines 18 feet 6 inches apart. The one to the west is a green and purple slate bed with a metasomatic laminated quartz vein with partings of crushed slate and large plates of mica, similar to the mica in an adjacent dyke, which fills an east and west fault. This fault throws the strata on its southern side 30 feet to the west. The more easterly indicator is similar, but is narrower and contains but little mica.

They both strike N. 20° W., and dip eastward at an angle of 65°.

Two cross fissures have been worked here; the northern is the better of the two, only prospects of gold having been found in the southern.

The northern cross fissure strikes E. 18° N., and dips 75° southward, cutting both indicators. The western line, which carries the large mica, yielded best, although very little work has been done on either. The gold yield is from the northern cross vein, reported as 20 ozs. in all, including one solid piece of 5 ozs.

Opposite the cross veins on the north-west slope of the hill a large patch of surface has been worked; it is said that very good yields of coarse gold were obtained, including small nuggets up to 4 ozs. in weight.

The cross dyke mentioned above is several feet in width and somewhat similar to the lamprophyres occurring at Maryborough, having a strong outcrop of ironstone as a cap. These indicators, which are in a series of pitted green and purple slate and variegated fine sandstones, are worthy of further prospecting.

### Main Indicator Belt.—The Middle Series.

Only a little work has been done along the Middle Series, and that at Rowle's Gully and Graham's Gully, Wareek.

Here also there are at least two parallel lines close together, and the western line has been tried in one place at Rowle's Gully, where a cross vein dipping at a high angle yielded 26 ozs. of gold, but no systematic prospecting has been done in the whole series north and south.

In the hill country, where the Ordovician beds outcrop, this series can be traced from south of Adelaide Lead railway station to George's Gully, near Alma, on the north, where nuggets up to 143 ozs. in weight were found in the alluvial.

Rowle's Gully yielded nuggets up to 20 ozs., and in addition a large area was puddled for constant yields of coarse gold.

As usual these lines are green to purple pitted slate beds, carrying well-defined metasomatic veins of laminated saccharoidal quartz.

Since coarse gold and occasional large nuggets have been found all along these indicator lines, there is here a good opportunity for systematic indicator prospectors.

### Main Indicator Belt.—The Western Series.

This series can be traced from Lacey's cross fissure, Balaclava, to Rowe and Lacey's on the south at the railway line passing alongside the old Crown and Kettle workings.

The indicator strike N. 15° W., and dips 80° westward. The cross fissures dipped south at a high angle. The indicators are as usual pitted slates with laminated quartz veins. Very little information is obtainable as to this series, but one cross vein worked by Rowe and Lacey yielded £700 worth of gold. Alluvial gold has been shed on all sides adjacent to this line.

### The Western Indicator Belt.

This area has been little prospected either for alluvial or quartz reefs, and in the few instances where mining has been attempted, the results have been on the whole disappointing.

The Ordovician beds are mostly sandstones of fine to medium grain, with narrow beds of slate, more or less ferruginous, and pitted only in a few instances.

In the western portion a ferruginous slate bed under half an inch in width yielded graptolites characteristic of the Lancefield zone of the Lower Ordovician series.

Several beds consisting of pitted slate with the usual vein of laminated quartz similar to the indicators already described were noted, but none of them have been prospected.

Of the lines along which at one point a little alluvial gold has been shed, those at Steed's Gully and Wareek Rush may be mentioned. At Steed's Gully all the gold was coarse, and pieces up to ½ oz. and ¾ oz. in weight were found. At its source there is a pitted slate bed, with laminated quartz and manganese oxide, which may have an auriferous cross vein close by.

At Wareek Rush all the gold was coarse and included pieces 2 ozs. in weight, but the wash was payable only through a few claims. An indicator line is traceable for some distance and passes through the prospectors' claim, and a cross vein on this line may be the source of the alluvial gold.

In Dalavadona's Gully a narrow red gutter yielded patchy coarse gold, with a nugget of 5 ozs., but the source of this gold has not been traced. The large quartz reefs and blows are very barren, and in no case have they been worked, and the gold probably came from an indicator.

### Other Indicator Lines.

On Bristol Hill several lines of indicator outcrop; one of these has been recently prospected with poor results. They are the usual green pitted slate beds, with the accompanying laminated quartz veins (metasomatic). They strike with the strata and dip 85° to the west on the western slope of the hill.

The cross veins which were opened dipped at an angle of 60° to the south. Although encouraging prospects were obtained at times, nothing payable was proved. As there are several parallel lines on the hill, there is room for further prospecting in search of better cross veins. These should occur, since coarse gold and nuggets have been obtained at times, as for instance, near the Old Cemetery on the north, and in California Lead, opposite Conway's Reef workings.

At Mariner's and Soldier's Hill, similar lines were noted, but none of these have been prospected. In Hawke's and Peel's claim, a bed of green slate, said to be several feet thick, has been followed while mining cross spurs and fissures.

Other lines to the north are Gribble's Indicator, east of Timor, and Lunn's Indicator, west of Havelock. Chadwick and party worked the Inkerman Dredge indicator near Swan's line for very profitable returns, one rich patch yielding 18 ozs.

Of the many lines which occur, none have been prospected away from the proved richer indicators. In the case of those untried lines which head alluvial gold leads, there is a promising field open to the indicator prospector.

## VII.—ROAD METAL AND BUILDING MATERIALS.

In the area under survey there are a number of small quarries which are of local importance only.

Flagstone quarries are seen east of Maryborough in the Western Sandstone Belt, the slate beds being hard and narrow. There are similar quarries near the Cemetery up the western hill side. These have been used in forming some of the street channels.

Sandstone quarries occur in many places amongst the harder beds, as at Keilor's Hill west, and Bristol Hill east.

Some of the large dykes have been quarried for road metal, as at the Cemetery quarry, and Coleman's Donkey Gully quarry. The hard portion of the porphyry dyke at Bristol Hill makes good building stone and has been used for instance for constructing the Mining Board Office, Maryborough.

For road metal, basalt is largely used in the western area, and quartz wash and cements in the eastern area among the old alluvial mines.

For building purposes the basalt south of the Wareek State school has been quarried, Norwood homestead being constructed of it.

Bricks are made locally, as there is a quantity of suitable material conveniently situated south of the township at Blackman's and the Main leads.

## VIII.—POTTERY CLAYS.

Around Maryborough there are numerous deposits of alluvial clays in the various old leads, and many soft, decomposed, white dyke rocks. Eleven samples of these clays and dyke rocks were carefully chosen and sent to the Departmental Laboratory to be tested by Mr. P. G. W. Bayly, who supplied the following information concerning them :—

List of Clays tested at the Departmental Laboratory.

| Number. | Description. | Locality. |
|---|---|---|
| 1908 .. 545 | Impure kaolin, dirty white .. .. .. | Near North German shaft, Chinamen's Flat |
| 546 | ,, ,, ,, .. .. .. | Well-in-Desert Lead, Timor |
| 547 | Decomposed dyke, white, and containing quartz crystals | "Pipeclay Holes," Bristol Hill |
| 548 | ,, ,, ,, ,, ,, ,, | Open cut, top of Bristol Hill |
| 549 | Hard dyke material, non-stained .. .. | Chow Chow dyke, Chinamen's Flat |
| 550 | Impure kaolin, fine-grained and free from grit .. | Slaughter Yard Hill, Alma |
| 551 | ,, ,, ,, quartz grains .. .. | ,, ,, ,, |
| 552 | ,, ,, ,, no grit .. .. | Pascoe's Milkmaid Lead, Havelock |
| 553 | ,, ,, ,, quartz grains .. .. | Harry's allotment, Timor South |
| 554 | ,, ,, ,, .. .. .. .. | Maher's Cyanide Works, Timor West |
| 555 | Very white kaolin, fine-grained and pure .. .. | Fraser's Reef, North British, Leviathan |

The localities of these clay deposits are marked on the Quarter Sheet.

These materials all have a high silica content, judging from the fire tests. This is confirmed in some by the analyses. No. 555 is the nearest to a good china clay kaolin. The clays were all treated in the usual manner for fire testing. Samples were broken down and passed through a 60 sieve, made up into briquettes, and allowed to dry, then treated in the muffle and wind furnaces in the usual manner.

Analyses were made of the best of the samples, as judged by their behaviour in the furnace. Nos. 545 and 548, analyses complete and rational; and Nos. 549 and 555, complete only.

Fire Tests of Clays.

| Laboratory Number. | Air Dried. Remarks. | Muffle. Temp. 1,100° C. Shrinkage. | Muffle. Temp. 1,100° C. Remarks. | Muffle at 1,150° C.; then Wind Furnace at 1,450° C. Shrinkage. | Muffle at 1,150° C.; then Wind Furnace at 1,450° C. Remarks. | Wind Furnace; Single Burning. Shrinkage. | Wind Furnace; Single Burning. Remarks. |
|---|---|---|---|---|---|---|---|
| 1908 | | % | | % | | % | |
| 545 | Plasticity small, little coherence, dull white | 4·5 | Firm, hard briquette; dull white | 11·0 | Slightly vitrified; stone grey | 11 | Hard, good firm brick; yellowish white |
| 546 | Plasticity small, little coherence, white | 9·5 | Firm, hard briquette; reddish | 14·5 | ,, ,, ,, | 12·5 | Incipient fusion, vesicular, bleby |
| 547 | Plasticity small, little coherence, brownish white | 1·5 | Soft briquette, white .. | 9·5 | Not vitrified; dirty white.. | 9·5 | Hard yellowish briquette |
| 548 | Plasticity small, little coherence; dull white | 1·5 | ,, ,, . | 8·0 | ,, ,, .. | 8·0 | ,, ,, |
| 549 | Hard dyke briquette .. | 3·0 | ,, ,, cream . | 9·5 | ,, ,, . | 9·5 | ,, ,, |
| 550 | Soft white briquette, non-plastic | 4·5 | Hard briquette; cream . | 9·5 | Vitrified; stone grey .. | 9·5 | Hard grey stoneware |
| 551 | ,, ,, ,, | 6·0 | ,, ,, reddish white | 9·5 | ,, ,, .. | 9·5 | Incipient fusion, vitrified, edges sharp |
| 552 | ,, ,, ,, | 6·0 | ,, ,, .. | 14·5 | ,, ,, .. | 14·5 | ,, ,, ,, |
| 553 | ,, ,, ,, | 6·0 | ,, ,, Brownish | 14·5 | ,, ,, ,, | 12·5 | ,, ,, ,, |
| 554 | ,, ,, ,, | 3·0 | ,, ,, | 9·5 | Not vitrified; light yellowish grey | 11·0 | Yellowish briquette; vitrified |
| 555 | ,, ,, ,, | 6·0 | ,, ,, very white | 9·5 | Very white .. .. | 9·5 | Very white |

Note.—The amount of shrinkage during air drying was insignificant, probably on account of the small amount of hygroscopic water present.
Remarks on the uses to which these clays could be put, together with the chemical analysis of some of them, will be found below.
Those marked Class B are suitable for stoneware, sewer pipes, cooking crocks, Bristol ware, and chemical stoneware.
Class C.—Yellow ware, Rockingham ware, teapots, pedestals, majolica, &c.
Class D.—Granite ware, household utensils, and general white pottery ware. These articles are made from clay to which is added with body flux (felspar or Cornish stone), flint and kaolin.

COMPOSITION, USES, ETC., OF THE CLAYS.

No. 545—Near North German Shaft.

*Complete and Rational Analyses.*

| | Complete Analysis of Entire Clay at 110° C. | Portion Insoluble in $H_2SO_4$. Quartz, Sand, and Felspar. A. and B. | Percentage Composition of Clay Substance. C. | Rational Analysis. | |
|---|---|---|---|---|---|
| | % | % | % | | |
| $SiO_2$ .. .. | 65·95 | 41·85 | 44·07 | | |
| $Al_2O_3$ .. .. | 22·17 | 2·06 | 36·76 | | |
| $Fe_2O_3$ .. .. | 1·07 | .. | 1·96 | | |
| FeO .. .. | 0·13 | .. | 0·24 | A. Quartz sand .. | 34·62 per cent. |
| MgO .. .. | 0·06 | Nil | 0·11 | B. Felspathic mineral .. | 9·29 ,, |
| CaO .. .. | Trace | Nil | Trace | C. Clay substance .. | 54·70 ,, |
| $Na_2O$ .. .. | 0·54 | Nil | 0·99 | | 98·61 |
| $K_2O$ .. .. | 2·82 | Nil | 5·15 | | |
| $H_2O+$ .. .. | 5·32 | .. | 9·73 | | |
| $TiO_2$ .. .. | 0·37 | .. | 0·67 | | |
| Cl .. .. | 0·18 | .. | 0·32 | | |
| $SO_3$ .. .. | Trace | .. | Trace | | |
| $P_2O_5$ .. .. | Trace | .. | Trace | | |
| | 98·61* | 43·91 | 100·00 | | |

Original $H_2O$ = 0·56.

*Less O = 98·57 %.

This material represents a siliceous clay fairly high in alkalies. The comparatively small shrinkage on burning is due to the low percentage of hygroscopic water, and the fairly high silica.

It would be useful for glazed stoneware. Class B.

No. 546.—Well-in-Desert Lead, Timor.—A clay inferior to 545 and containing more iron. At a high temperature the briquettes were vesicular.

No. 547—" Pipeclay Holes," Bristol Hill.—Similar to No. 548, Bristol Hill. Class B or C.

No. 548—Open Cut, top of Bristol Hill.—Field Note :—This deposit is over 20 feet wide and is traceable for about 20 chains along the line of dyke ; the two samples 547 and 548 were taken about 15 chains apart.

*Complete and Rational Analyses.*

| | Complete Analysis of Entire Clay at 110° C. | Portion insoluble in $H_2SO_4$. Quartz, Sand, and Felspar. A. and B. | Percentage Composition of Clay Substance. | Rational Analysis. | |
|---|---|---|---|---|---|
| | % | % | % | | |
| $SiO_2$ .. .. | 73·56 | 52·98 | 44·80 | | |
| $Al_2O_3$ .. .. | 18·52 | 0·12 | 40·05 | | |
| $Fe_2O_3$ .. .. | 1·56 | Trace | 3·40 | | |
| MgO .. .. | Trace | Trace | .. | A. Quartz sand .. | 52·56 per cent. |
| CaO .. .. | Nil | Nil | .. | B. Felspathic detritus .. | 1·27 ,, |
| $Na_2O$ .. .. | 0·36 | 0·73 | 0·56 | C. Clay substance .. | 45·93 ,, |
| $K_2O$ .. .. | 0·63 | | | | 99·76 |
| $H_2O$ .. .. | 5·13 | .. | 11·19 | | |
| $TiO_2$ .. .. | Nil | .. | .. | | |
| Cl .. .. | Trace | .. | .. | | |
| $SO_3$ .. .. | Nil | .. | .. | | |
| $P_2O_5$ .. .. | Nil | .. | .. | | |
| | 99·76 | 53·83 | 100·00 | | |

Original hygroscopic $H_2O$ = 0·24.

The above is a dyke material with high silica content and comparatively low in alkalies. The rational analyses shows the felspathic material to be low. This clay would be suitable for the better class of glazed stoneware or yellow ware. Class B or C. Low shrinkage, 8 per cent. A large sample of this material was sent to the Franco-British Exhibition, amongst a number of Victorian clays.

No. 549—Chow Chow Dyke, Chinamen's Flat.—A dyke material similar to No. 548, but lower in silica. Shrinkage is higher (9·5 per cent.), but is low enough for stoneware. Class C. A complete analysis of the dried clay is given below; no rational analysis was made—

| | % |
|---|---|
| $SiO_2$ | 69·13 |
| $Al_2O_3$ | 22·06 |
| $Fe_2O_3$ | 1·00 |
| FeO | 0·13 |
| MgO | 0·23 |
| CaO | Trace |
| $Na_2O$ | 0·09 |
| $K_2O$ | 1·63 |
| $H_2O$ | 6·27 |
| $TiO_2$ | 0·42 |
| Cl | 0·06 |
| $SO_3$ | Trace |
| $P_2O_5$ | Trace |
| | 101·02 |
| Less O = Cl | ·01 |
| Total | 101·01 |
| Original hygroscopic moisture | 1·20 |

No. 550—Slaughter Yard Hill, Alma.—Impure clay, infusible, with low shrinkage. Class B.

No. 551—Slaughter Yard Hill, Alma.—Similar to 550. Class B.

No. 552—Pascoe's Milkmaid Lead, Havelock.—Similar to No. 550. Higher shrinkage. Class B.

No. 553—Harry's allotment, Timor South.—Similar to No. 550, but more vitreous at higher temperature. Class B.

No. 554—Maher's Cyanide Works, near Bismarck mine, Timor West.—A hard stoneware clay, dark in colour, no fusion, fairly low shrinkage (11 per cent.) Class B.

No. 555—Fraser's Reef, Leviathan.—A white kaolin clay of fair quality. The plasticity is good, but the clay has a low binding power. The shrinkage is unusually low for this calss of material, probably on account of the low percentage of hygroscopic moisture. A useful whiteware clay. Class D. A complete analysis is given below—

| | No. 555 (Dried sample). % |
|---|---|
| $SiO_2$ | 45·10 |
| $Al_2O_3$ | 39·13 |
| $Fe_2O_3$ | 0·68 |
| FeO | 0·09 |
| MgO | 0·14 |
| CaO | Nil |
| $Na_2O$ | 0·70 |
| $K_2O$ | 0·46 |
| $H_2O$ | 14·27 |
| $TiO_2$ | Trace |
| Cl | 1·15 |
| $SO_3$ | Trace |
| $P_2O_5$ | Nil |
| | 101·72 |
| Less O=Cl | 0·25 |
| | 101·47 |
| Original hygroscopic moisture | 1·22 |

# APPENDIX I.

## EUCALYPTS OF THE MARYBOROUGH DISTRICT.

The following general notes on the various Eucalypts occurring in the area embraced by the Maryborough Quarter-Sheet have been compiled from my own observations, and from notes kindly supplied to me by Messrs. J. Semmens and J. Watson, District Foresters, Maryborough.

Each Eucalypt is dealt with in order of quality and value as a timber in this district, and it is remarkable that some of those species which are generally sought after in other districts are inferior here.

The Eucalypts, in order of quality, &c., as found in the Maryborough District may be arranged as follows:—

(1) Box-tree, Grey. *Eucalyptus hemiphloia*, F.v.M.
(2) Ironbark, Red. *Eucalyptus sideroxylon*, F.v.M.
(3) Box-tree, Yellow. *Eucalyptus melliodora*, Cunningham.
(4) Ironbark, White. *Eucalyptus leucoxylon*, F.v.M.
(5) Box-tree, Red. *Eucalyptus polyanthema*, Schauer.
(6) Box-tree, Apple. *Eucalyptus goniocalyx*, F.v.M.
(7) Stringybark. *Eucalyptus macrorrhyncha*, F.v.M.
(8) Redgum. *Eucalyptus rostrata*, Schlechtendal.

1. *Eucalyptus hemiphloia*, Grey Box-tree.—This timber grows mainly on the flats and in all the gullies, besides being plentiful on the hills and ridges, excepting the ironbark ridges, where it is only occasionally found.

The present standard trees would average about 7 to 8 inches in diameter at the butt, and some of them reach a height of 60 feet.

The Grey Box-tree may be classed with *Eucalyptus sideroxylon* (Red Ironbark) as the best timber in this district: It is excellent, both for mining purposes and for fuel, and is one of the most plentiful of the Eucalypts in this locality.

2. *Eucalyptus sideroxylon*, Red Ironbark.—This is a very valuable timber, and grows only in certain belts, where it is confined to the main hill tops and ridges. A belt in the Havelock State Forest runs as far north as the northern boundary of the Maryborough parish. It trends south through Bristol Hill, from which a western area extends to Hobson's, north-west of the Leviathan Mine. Going south, this Red Ironbark area heads the Main and Blackman's Leads, and turns northward through Blucher's, Flagstaff, and as far as Roger's allotment (White Hills).

In size, this timber is 7 to 8 inches in diameter at the butt of standard trees, and it grows to a height of about 60 feet. It is a very sound timber, and excellent for mining purposes, besides being a first-class fuel. A plentiful growth follows almost exactly the belt of rocks containing the lamprophyre dykes. These dykes have had a considerable influence on the quality of the soil. Although the soil appears scanty and bare on account of the outcrops of the Ordovician strata, yet what there is of it is richer than it is in other places where there are no dykes of this type.

3. *Eucalyptus melliodora*, Yellow Box-tree.—This is a good class of timber, but is rather scarce; it is only found with *Eucalyptus rostrata* (Red-gum) along the main creeks, such as the Bet Bet Creek, &c.

It splits well, is fairly sound, very suitable for mining purposes, and a good fuel. Trees 50 feet in height are found, but, as stated before, the supply is very limited.

4. *Eucalyptus leucoxylon*, White Ironbark.—Grows in many of the gullies and flats, as well as on nearly all the hills and ridges, including the areas where *Eucalyptus sideroxylon* (Red Ironbark) is seen.

It is the best splitting timber in the district, a fair mining timber, and a medium fuel. Trees up to 60 feet in height are sometimes seen, and the average standard growth would measure about 8 inches in diameter at the butt. It is very plentiful, but is attacked by wood borers more than any of the other Eucalypts in this district.

5. *Eucalyptus polyanthema*, Red Box-tree.—This Eucalypt grows on all the hills and ridges and in the gullies outside the Red Ironbark areas, excepting that area south of Adelaide Lead, where it is found together with *Eucalyptus sideroxylon* (Red Ironbark).

Some exceptional trees reach a height of 40 feet, but generally it is of very stunted growth. It does not split well, having a twisted grain, besides being very often unsound. As a mining timber it is fairly good, and is a useful fuel. It is plentiful in and around Maryborough.

6. *Eucalyptus goniocalyx*, Apple Box.—Occurs on most of the hilly country and in the gullies. It splits only moderately well, and is stunted in growth, but some trees reach a height of 40 feet.

It is often inclined to be hollow. Although plentiful, it is not much sought after, as it is only a fair timber for mining, and a poor fuel.

7. *Eucalyptus macrorrhyncha*, Stringybark.—This only occurs in a small area between Adelaide Lead and Moonlight, to the south of the Avoca–Maryborough line, and to the south-west of Mariner's Reef. The diameter of this tree averages 5 inches, and it attains a height of 50 feet. It is a very easily split timber, but in this district the trees are not very sound. As a mining timber it is said to be fair, and as a fuel poor.

8. *Eucalyptus rostrata*, Redgum.—This timber occurs along the banks of the main creeks, such as Bet Bet Creek, where the larger parent trees are found, whilst on the smaller creeks a younger growth predominates. Although one of the best timbers in other districts, it is of poor quality here, and is little used either for mining or fuel.

The foregoing notes deal with the timbers generally, and the size, &c., refers to trees of standard growth, but the forests having had a clean felling, there is also now established a healthy coppice growth of smaller timber in various stages of development, gradually advancing towards the standard size.

## TABLE OF TIMBERS.

| Name. | | Character. | | Dimensions. | | Where Found. | Uses. | Quantity. |
|---|---|---|---|---|---|---|---|---|
| Specific. | Common. | Bark, &c. | Timber. | Height. | Diameter at Butt. | | | |
| *Eucalyptus hemiphloia*, F.v.M. | Grey Box .. | Bark persists on stem. Somewhat wrinkled, but never deeply furrowed. The bark on branches strips in long flakes | Close grain, and not fissile. Timber strong, but stems often hollow with age | Up to 60 feet .. | 7 inches to 8 inches in standard trees | On flats and low sloping hills | As a mining timber one of the best, and an excellent fuel | Plentiful |
| *Eucalyptus sideroxylon*, F.v.M. | Red Ironbark .. | Bark very thick, and deeply furrowed; nearly black in outside colour | Close grained. Timber red, hard, very sound, and strong | Up to 60 feet .. | 7 inches to 8 inches in standard trees | In certain belts on the main hill tops and ridges but not in the flats | An excellent mining timber, and a very good fuel | Plentiful |
| *Eucalyptus melliodora*, Cunningham | Yellow Box (honey-scented or Dargan of the Gippsland aboriginals) | Bark brown-grey outside, but yellow inside. Slightly fibrous and contorted bark. Branches often smooth | In Maryborough District fairly fissile, and easy to work. Timber durable, heavy, and tough | Up to 50 feet .. | 7 inches to 8 inches in standard trees | Found along main creeks and in patches on the larger flats | A good mining timber and fuel | Very limited |
| *Eucalyptus leucoxylon*, F.v.M. | White Ironbark .. | Smooth white and grey bark but not persistent | One of the best of splitters, and fairly sound, but attacked by borers | Up to 60 feet .. | 7 inches to 8 inches in standard trees | Found throughout the hills and flats | Fair as a mining timber, but only a medium fuel | Plentiful |
| *Eucalyptus polyanthema*, Schauer | Red Box .. | Grey outside, and slightly furrowed | A close-grained red wood. Tough and hard, but often is unsound | Stunted, sometimes up to 40 feet | 7 inches to 8 inches in standard trees | On hills outside the Red Ironbark areas generally, and in gullies | A fair mining timber and a useful fuel | Rather plentiful |
| *Eucalyptus goniocalyx*, F.v.M. | Apple Box .. | Grey colour, not persistent in branches | A medium splitter, but inclined to be hollow | Very stunted, but found up to 40 feet or so | 7 inches to 8 inches in standard trees | On the hills and ridges .. | Not much sought after as a mining timber, and a poor fuel | Plentiful |
| *Eucalypus macrorrhyncha*. F.v.M. | Stringybark .. | Brown fibrous bark, thick, and slightly furrowed | Splits easily, but trees not very sound in this district | Up to 50 feet .. | Average growth 5 inches diameter | On hills to south of Avoca line in places | Fair mining timber for panels, but a poor fuel | Limited |
| *Eucalyptus rostrata*. Schlechtendal | Redgum .. .. | Smooth grey or whitish to brown | Tough, hard, red timber, but in this district not very sound and of poor quality | Up to 50 feet .. | 2 feet or more in parent trees along the larger creeks, but a smaller growth along smaller creeks | Along the creek banks and scattered in the valleys | In this district not much used on account of its quality | Not plentiful and confined mainly to the creeks |

ADDITIONAL NOTE.—Scattered amongst the forest growth there are patches of wattle, whilst on the Black Range country to the west some bull oak trees are seen.

# APPENDIX II.

## PETROGRAPHICAL NOTES ON SOME ROCK SPECIMENS FROM MARYBOROUGH.

*By D. J. Mahony, M.Sc., F.G.S.*

A microscopical examination was made of some of the rocks collected by Mr. A M. Howitt during his geological survey of the Maryborough district. Some of the dykes are of special interest, since they are closely associated with auriferous quartz reefs which lie between them and the surrounding country rock. Such dykes are all lamprophyres or porphyrites; other dykes occur, but the same relation to the auriferous quartz does not then exist. Lateral off-shoots from the dykes also appear to have an effect on the gold content of the quartz reefs which they intersect.

The lamprophyres are known to occur in a number of Victorian gold-fields. Mr. Howitt has shown that the porphyry dyke at Bristol Hill has been cut through by a fault line, along which a porphyrite dyke has been injected; the latter rock is therefore the younger. He also is inclined to think that the lamprophyre dykes are still later, though there is no definite evidence by which their relative age can be determined.

Some of the dyke rocks (lamprophyres and porphyrite) were found to be auriferous when assayed, Splitter's dyke, for instance, carrying over 3 dwts. of gold per ton (see p. 21): to get the average value per ton it would be necessary to sample these dykes thoroughly.

### The Lamprophyres.

The lamprophyres are usually quite decomposed near the surface, where they resemble red, yellow, or purple clays, but at a depth they are dark-green rocks. The only instance noticed at Maryborough of one of these rocks being much decomposed at any considerable distance from the surface was at the 528-ft. level of the Mariner's Reef, where a horizontal dyke is reduced to a soft clay. Under the microscope even the more fresh-looking samples are usually found to be a good deal decomposed. The formation of calcite, as a result of alteration of the other minerals, is constantly observed. An analysis of the clay resulting from the decomposition of one of these rocks is given on page 69.

The following are short descriptions of some examples:—

*No.* 1049. *Bristol Hill.*—From the horizontal dyke mentioned on pp. 43 and 44 as dipping from Pekin Hill into Bristol Hill. The specimen was collected from the mullock heap. In this case the connexion of the dyke with the auriferous reef could not be examined since the workings were inaccessible at the time of the survey. The rock is very decomposed, consisting of quartz, chlorite, kaolin, calcite, and small flakes of white mica. Some of the quartz is certainly not an original constituent of the rock, and the other minerals have been developed from the decomposition of the original minerals. These changes have also almost obliterated the original structure, but the rock is seen to be fine-grained and not porphyritic. Small rods of apatite are moderately plentiful, and iron ores are very rare. The rock is probably a decomposed lamprophyre.

*No.* 1149. *Dyke, Mariner's Reef, end of west crosscut, 628-ft. level* (see diagram, p. 33).—A fine, even-grained rock, consisting of small lath-shaped plagioclase crystals and flakes of biotite of about the same size, together with the decomposition products of these minerals and plentiful secondary calcite. Small well-defined hornblende crystals are common. The numerous patches of chlorite or serpentine either represent altered olivine or they may have resulted from the decomposition of the biotite and hornblende. A mica-hornblende-lamprophyre.

*No.* 1046.—Another specimen from the same mine collected on the mullock heap. It is a non-porphyritic rock, and is much decomposed, consisting of a fairly fine-grained aggregate of decomposing felspar laths, chlorite and calcite, with possibly a little quartz. One fairly large patch of serpentine occurs, and iron pyrites is moderately abundant. The rock is probably a decomposing lamprophyre.

*No.* 1044. *Blucher's Reef.*—The relation of this dyke to the auriferous reef is discussed on p. 40, and is illustrated by a section. The specimen examined came from the mullock heap; it is very similar to No. 1149, from the 628-ft. level at Mariner's Reef, but is rather coarser in grain, and on account of the decomposition, the presence of hornblende is not certain. Another specimen, No. 1045, of the same dyke is more decomposed, finer in grain, and contains some quartz which may, however, be secondary; otherwise it is similar to No. 1044.

*No.* 1047. *Frederick Line, Splitter's Reef* (see p. 54 for description and section of the dyke).—The specimen came from the mullock heap at the main shaft. It is decomposed, but the lath-like outlines of the small felspars have been preserved. The ferro-magnesian minerals are represented by chlorite. Calcite is abundant, and quartz grains are scattered over the slice. It is evidently closely related to the type represented by the better preserved specimens Nos. 1044 and 1149.

*No.* 1043. *Telegraph Reef* (see p. 50).—The rock consists of fine groundmass composed of chlorite and other alteration products, through which some phenocrysts, now represented by pseudomorphs of chlorite and calcite, are scattered. One appears to have been olivine and others hornblende. Through the groundmass are distributed numerous small elongated flakes of biotite (usually decomposed in part), quartz grains, and calcite. The two latter minerals appear to be of secondary origin. No felspars are discernable. The rock appears to be basic mica lamprophyre.

*No.* 1140. *Amy Castles Dyke* (see p. 51).—A mica lamprophyre. The felspars are not much altered, but the ferro-magnesian minerals are all decomposed. Calcite is plentiful.

*No.* 1142. *The Cemetery Dyke.*—The sample is entirely decomposed, and the structure destroyed. It consists of an indefinite mass of chlorite, kaolin, calcite, &c., and is probably a lamprophyre.

*Note.*—Mr. Howitt considers that the Blucher's, Splitter's, Telegraph and Amy Castles are all parts of the one dyke which has been displaced by faulting. This accords with their microscopical characteristics.

### The Porphyrites.

This term has been applied to certain dykes which differ from the typical lamprophyres in consisting of felspar phenocrysts set in a fine groundmass, but owing to the advanced stage of decomposition in the specimens examined, it is not possible to give any exact determination of the original mineral composition; for instance, it is not certain whether there were any ferro-magnesian minerals in the groundmass, though such minerals do not appear to have existed as phenocrysts. These dykes are probably related in composition to the lamprophyres. The Native Youth dyke, which is considered by Mr. Howitt to be similar to the porphyrites described, has auriferous quartz along its walls like several of the lamprophyres (see p. 52).

*No.* 1240. *Cross Dyke, Bristol Hill* (see p. 43).—This dyke is probably a continuation of the Native Youth dyke. It occupies a fault line which displaces the large porphyry dyke on Bristol Hill. The specimen examined, which was collected from the mullock heap, consisted of porphyritic felspars set in a fine groundmass. The felspars are somewhat decomposed, but one section in which multiple twinning is displayed, gave symmetrical extinctions of 16° from the plane 010, and another cut almost parallel to 010 obscured parallel to 001; this behaviour indicates the plagioclase andesine. The felspars, however, may not all be the same species, and some look like orthoclase. There are no phenocrysts of quartz or ferro-magnesian minerals. The fine-grained groundmass is much decomposed, and consists largely of secondary white mica and other derivatives from felspar, and calcite. There are fairly numerous short, stout, prisms of apatite.

*No.* 1950 *Leviathian Reef* (560-*ft. level*).—This rock, which is greatly decomposed, consists of felspar phenocryst (too much altered for exact determination) set in a fine groundmass composed entirely of alteration products, including plentiful calcite. A little quartz occurs in it, but this may not be an original mineral (see p. 29).

### The Quartz Porphyries.

These dykes are the largest and oldest in the Maryborough district, and a short description of them by Mr. Howitt will be found on p. 17. Their relation to the auriferous quartz is not the same as that of the lamprophyres and porphyrites. In the case of the Bristol Hill dyke, auriferous spurs of quartz are found adjacent to the igneous rock in the strata on both sides of it, but this is the only case in the district of the association of a dyke of this type with auriferous quartz and the association may be quite accidental. Mr. Howitt considers that the auriferous quartz is probably of the indicator type, since indicators occur in this locality and many of the spurs were barren while in some rich patches occurred. An analysis of the clay formed by the decomposition of this dyke is given on p. 68.

*No.* 1048. *Dyke, Bristol Hill* (see p 43).—The specimen, which was collected at the open cut on Bristol Hill, consists of idiomorphic phenocrysts of quartz, felspar and biotite, set in a fine-grained groundmass. The quartz is plentiful, and similar to that in the usual quartz felsites. The groundmass, which is very fine in grain, consists of felspar, quartz, and white mica, with a moderate amount of calcite, and some iron pyrites scattered through it.

*No.* 1143. *Dyke, Bristol Hill* (from mullock heap, west shaft).—This specimen is very similar to No. 1048, but there are no felspar phenocrysts and the groundmass is rather coarser. It would appear from this slice that much of the white mica is of secondary origin.

### Sedimentary Rocks.

A specimen of quartzite, No. 1051, from the Mariner's Reef mine was cut for microscopic examination, and was found to contain grains of felspar in addition to the quartz, and some patches of secondary calcite. A couple of small quartz veins traversing the slice also contain calcite.

Two specimens from the Rathscar Mine, Rathscar, were sliced as examples of the metamorphic rocks. One (No. 1134) is a fine-grained mica-schist, consisting of very plentiful biotite and muscovite in a mosaic of quartz. In places there is an augen structure, the centre of the "eyes" consisting of an indefinite greenish aggregate of minute indeterminable grains. The whole is traversed by thin quartz veins, which appear to bear no relation to the foliation.

The second specimen (No. 1133) from this locality is a fine-grained gneiss, consisting of plagioclase felspars in a groundmass of quartz grains and biotite.

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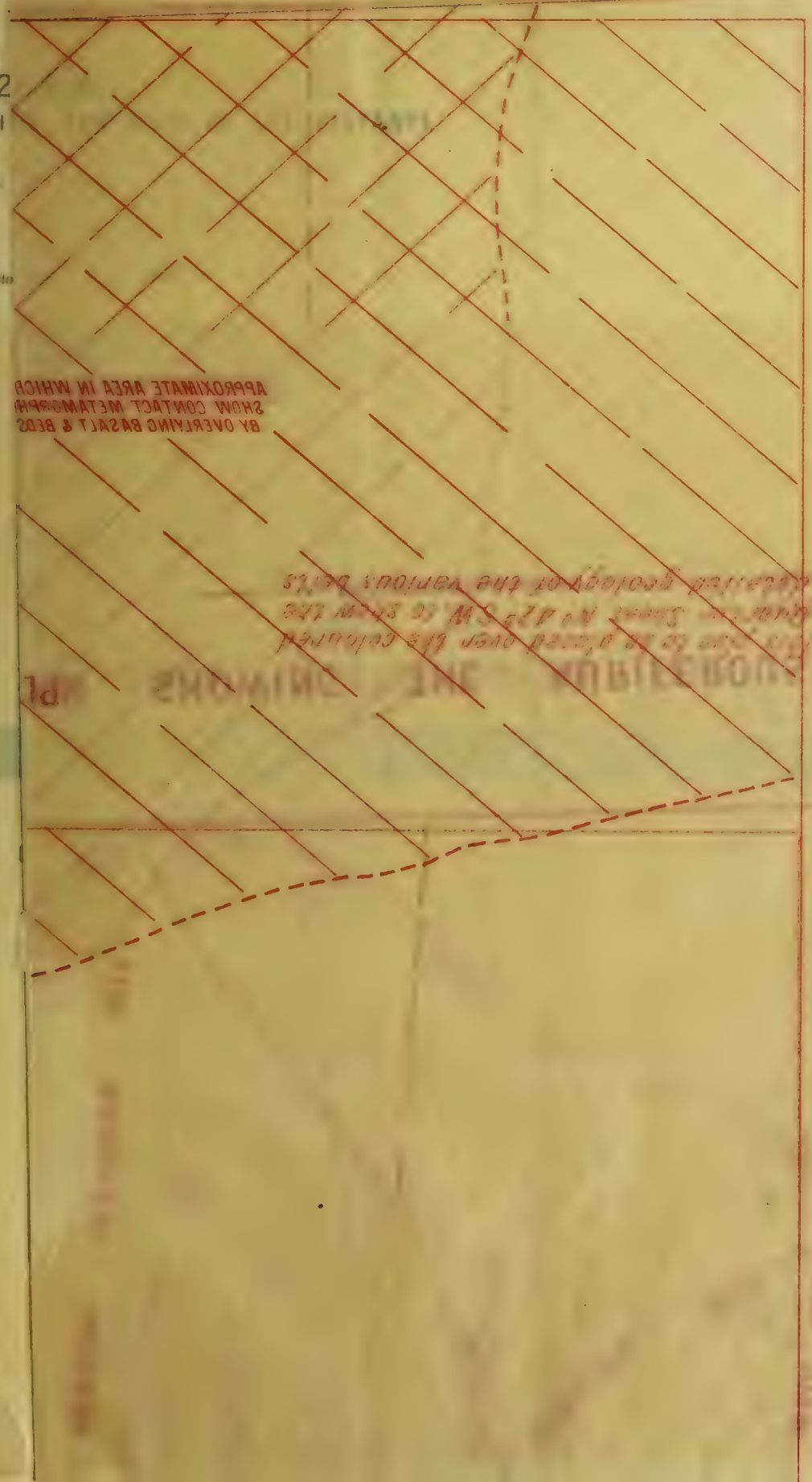
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APPROXIMATE AREA IN WHICH
SHOW CONTACT METAMORPH
BY OVERLYING BASALT & BEDS

Geological Survey of Victoria, Memoir No. XI

H. Herman Director
W. Dickason Secretary for Mines
The Hon. A. A. Billson M.L.A. Minister of Mines

APPROXIMATE AREA IN WHICH THE LOWER ORDOVICIAN ROCKS SHOW CONTACT METAMORPHISM. THEY ARE LARGELY OBSCURED BY OVERLYING BASALT & BEDS OF SAND CLAY & GRAVEL.

THE AURIFEROUS BELTS ARE POORER TO THE NORTH OF THIS LINE.

WESTERN INDICATOR BELT

MAIN INDICATOR BELT

WESTERN SANDSTONE BELT

WESTERN DYKE BELT

EASTERN SANDSTONE BELT

EASTERN DYKE BELT

SHAW'S REEF & HAVELOCK BELT

WHITE HILLS

SLAUGHTERYARD HILL

BRISTOL HILL

SOLDIER'S HILL

# PLAN SHOWING THE AURIFEROUS BELTS AND METAMORPHIC AREA

REFERENCE

—— —— BELT BOUNDARIES (Approximate) ---------- BOUNDARY OF RICHER AREA. AREA OF CONTACT METAMORPHISM.

NOTE:- This plan to be placed over the coloured Quarter Sheet No. 42½ S.W. to show the detailed geology of the various belts.

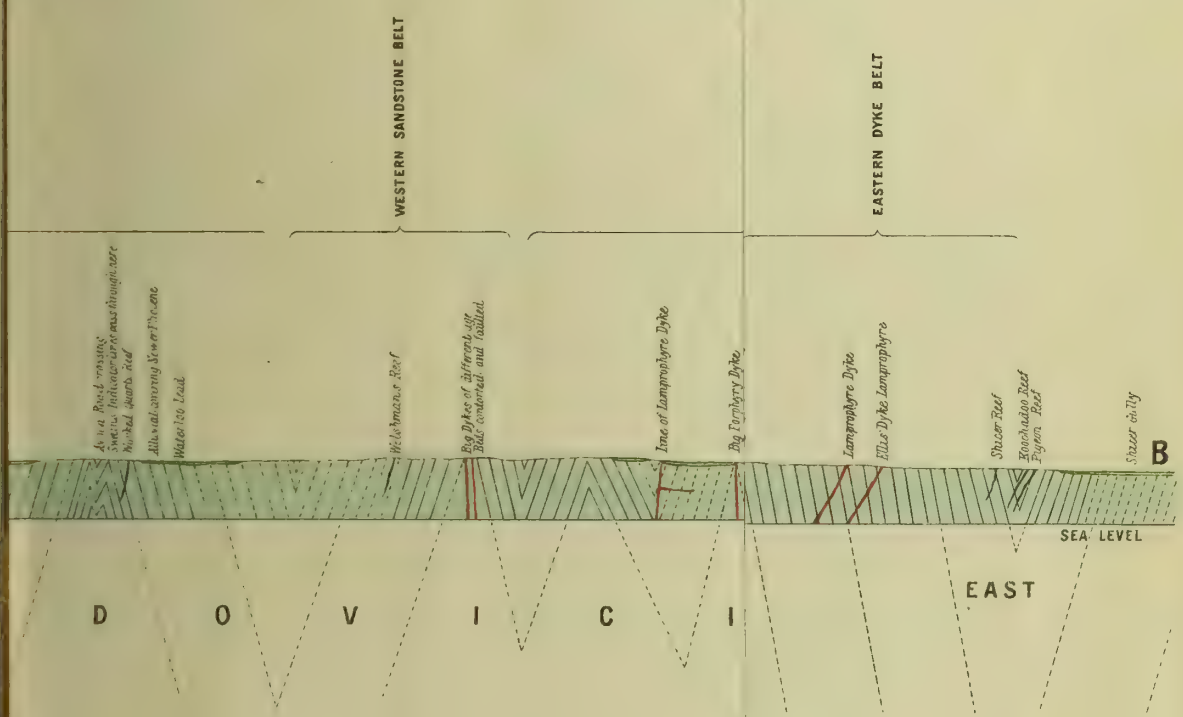
Plate No II

# 42° S.W.

## LINE FOR MOST OF THE DISTANCE

1 inch

wer Ordovician  / Dykes



# SECTION A. B. ACROSS
# MARYBOROUGH QUARTER SHEET Nº 42B S.W.
## FROM NEAR BUNG BONG STATION TO SHICER GULLY FOLLOWING RAILWAY LINE FOR MOST OF THE DISTANCE

SCALES,— Horizontal, 40 chains to 1 inch; Vertical, 2640 feet to 1 inch.

REFERENCE

Recent | Post Pliocene | Newer Basalt | Lower Ordovician | Dykes

GEOLOGICAL SURVEY OF VICTORIA

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The Hon. A. A. Billson M.L.A. Minister of Mines

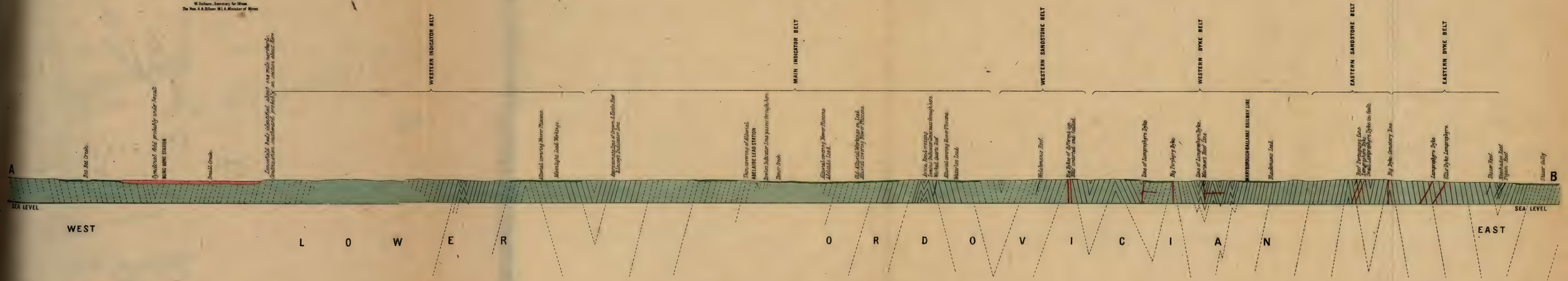
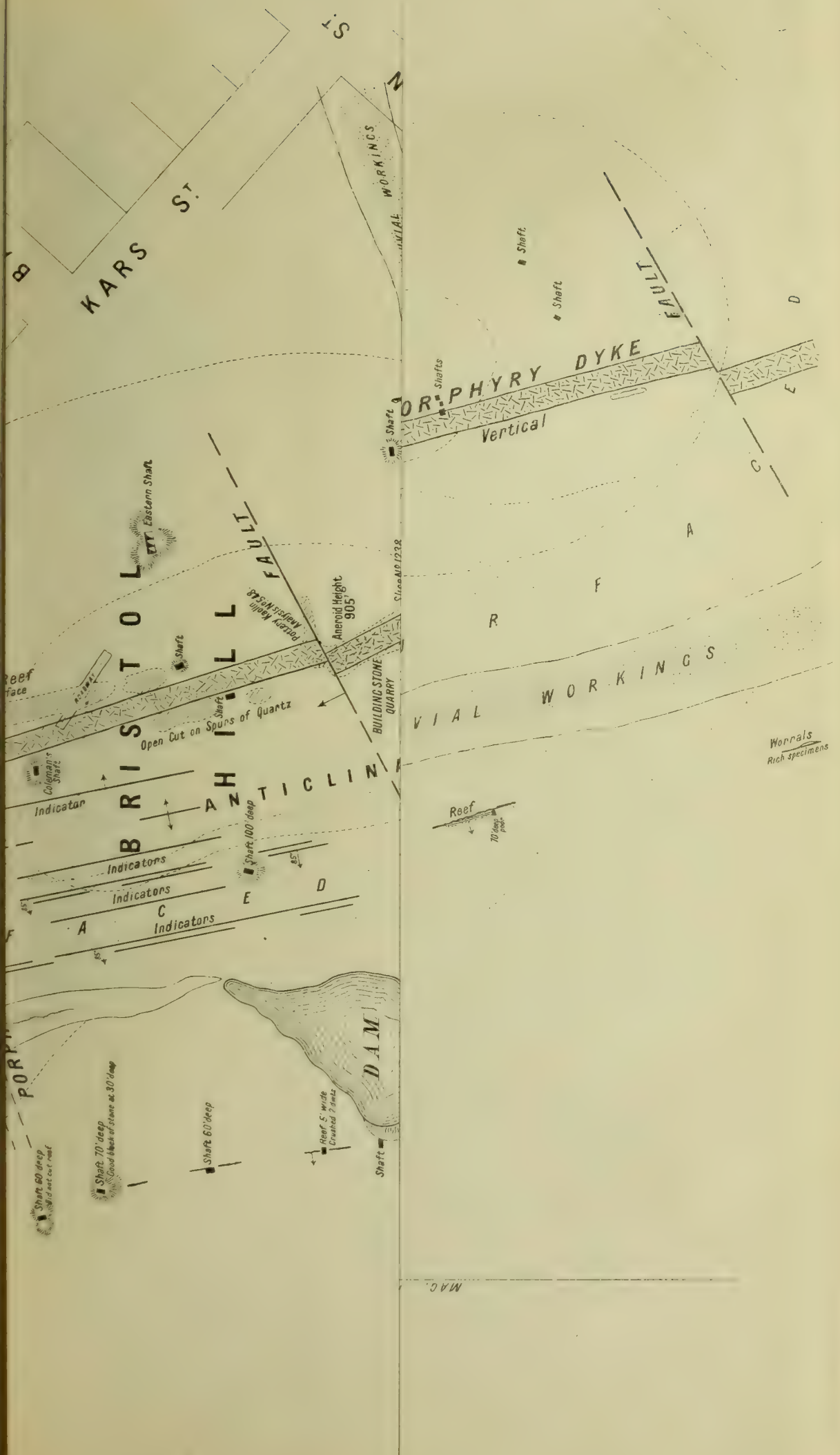


Plate No III


KARS ST.
WORKINGS
Shaft
Shaft
PORPHYRY DYKE
FAULT
Vertical
Shaft
Shafts
Eastern Shaft
Coleman's Shaft
Shaft
Reef face
Aneroid Height 905'
Shaft No 1232
BUILDING STONE QUARRY
Open Cut on Spurs of Quartz
Shaft
Indicator
Shaft 100' deep
Indicators
Indicators
Indicators
Reef
70' deep
Worrals
Rich specimens
WORKINGS
Shaft 80' deep
Shaft 70' deep
Shaft 60' deep
Reef 5' wide
Shaft

# PLAN OF BRISTOL HILL

Scale – 2 chains to 1 inch

REFERENCE

Alluvial Workings
Surfacing
Bedrock ——— Ordovician slates & sandstones




MARYBOROUGH & AVOCA RAILWAY
WILLIAMS'
HILL

# PLAN OF
# MARINER'S REEF
## LEASE Nº 5486
## Showing Reef Lines and Geological Features

REFERENCE

Alluvial lead  Shallow workings  Open cut

Anticline  Syncline  Dip  Shaft -

Scale - 4 Chains to 1 inch

*NOTE — Plan of Lease and Blocks supplied by Mr Clarence Smith District Mining Surveyor.*

GEOLOGICAL SURVEY OF VICTORIA

H. Herman. Director
W. Dickson. Secretary for Mines
The Hon A A Billson M.L.A. Minister of Mines.

MARYBOROUGH & AVOCA RAILWAY

REEF

Township
of
Maryborough

House

House

Limit of Lease

Shaft 100' deep

House

WILLIAMS' HILL

SURFACED

MARINER'S NORTH

Fault

Open cut 50' deep

Shaft 100' deep

House

Stockades Workings

Shaft

REEF

DYKE

MAC. MER.

GULLY

SURFACED

Shaft 22 feet deep

Mach Felspar in Mullock

REEF

SMALL STRIPED REEF

HAWKES & PEEL

Hawkes & Peel

Open cut 30' deep

SOLDIERS

GYMPIE REEF

SURFACED

HILL LINE

COLES LINE

Nº 5486

49A 2R 29P

SOLDIERS HILL REEF

Trench

REEF

Trenches

Large Caldwell Pyritary in Chase beds

Aneroid Height 885'

HAWKES & ROXBURGH

SOLDIER'S HILL

Hawkes & Roxburgh 110' deep

Mariners Main Shaft

APPROXIMATE LINE OF REEF

DYKE LAMPROPHYRE AT 600 LEVEL

WHERE LAMPROPHYRE DYKE SHOULD OUTCROP

MARYBOROUGH & BALLARAT RAILWAY

Shafts sunk to cut Mariners Reef

Whim

MARINER'S HILL

Mariners Reef

Whim

Cable Flood Channel

SURFACE

Hanging Wall

CUTTING

Old battery

Cyanide Vats

Sand

Cyanide Vats

BATTERY REEF

Open cut 50' deep

Sand

TAILINGS LICENSE

OUTCROP OF LAMPROPHYRE DYKE

PICANINNY REEF

70°

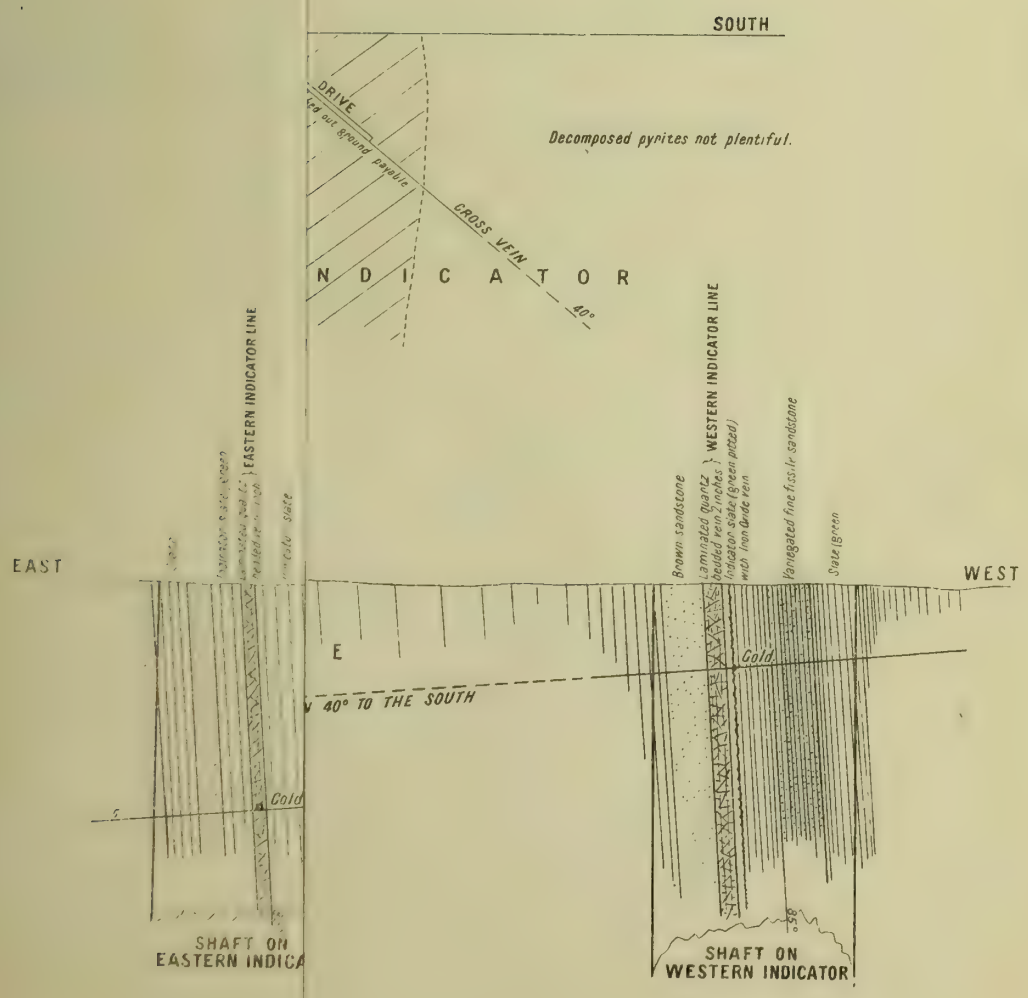
Plate VIII.

Plate N°V

# OO LEAD.

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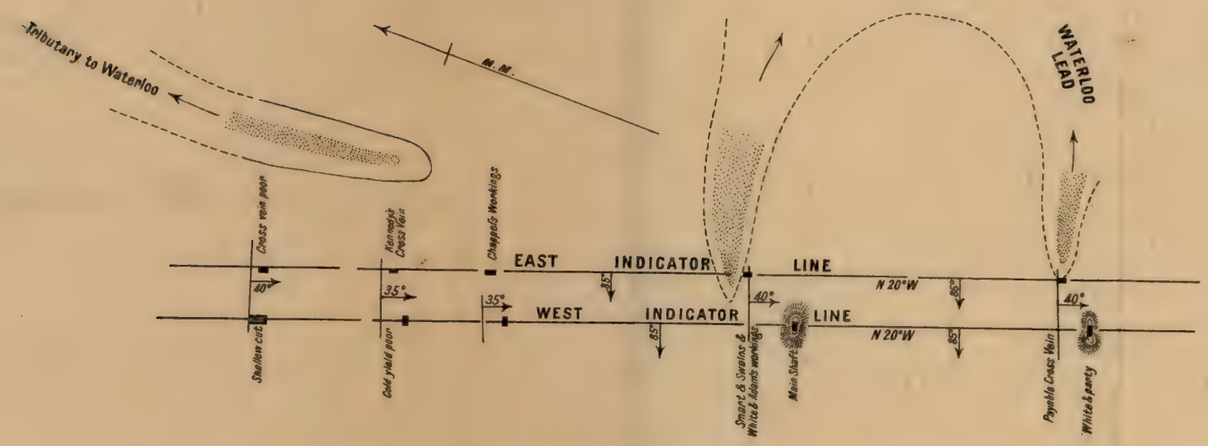


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# SMART AND SWAIN'S INDICATOR LINES, WATERLOO LEAD.
## MAIN INDICATOR BELT, EASTERN SERIES.

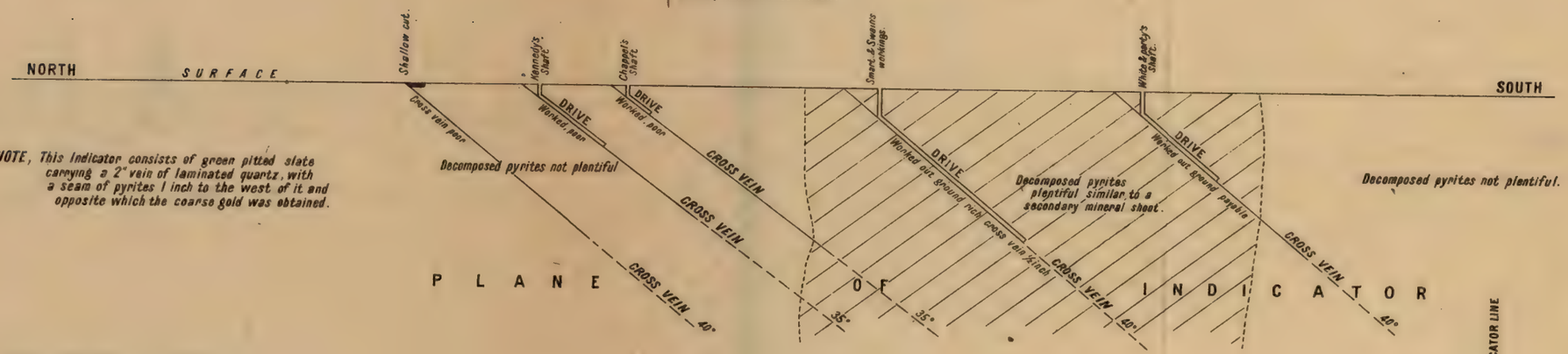
### PLAN
Showing the Two Indicators crossed by the same Quartz Veins.

Scale, 2 chains to 1 inch.



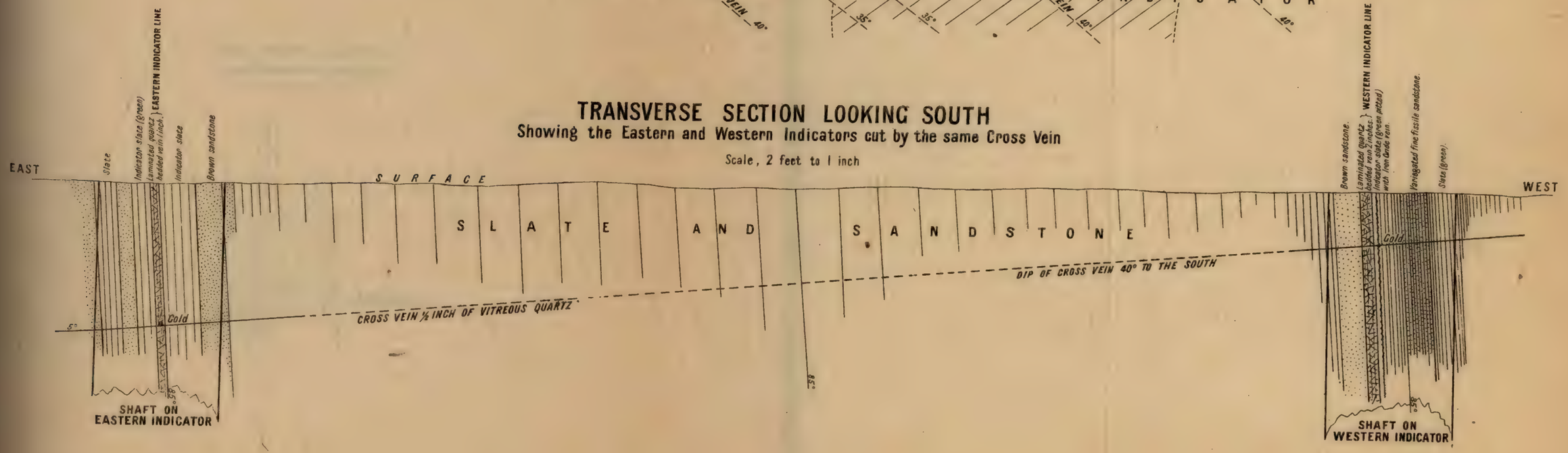

### LONGITUDINAL SECTION, WEST INDICATOR LINE.
Showing the Cross Veins

Scale, 2 chains to 1 inch.




### TRANSVERSE SECTION LOOKING SOUTH
Showing the Eastern and Western Indicators cut by the same Cross Vein

Scale, 2 feet to 1 inch



# SWAIN'S INDICATOR, INKERMANN

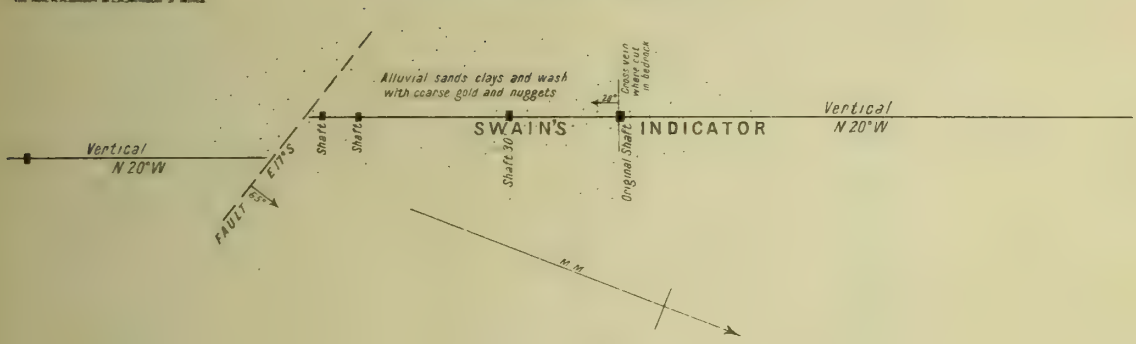
## MAIN INDICATOR BELT, EASTERN SERIES

H. Herman Director
W. Dickson Secretary for Mines
The Hon. A.A. Billson M.L.A. Minister of Mines

### PLAN

Showing Faulted Indicator

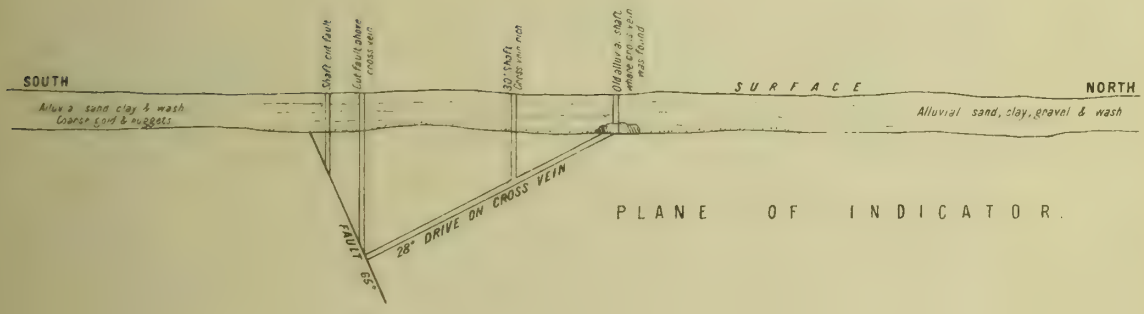
Scale, 60 feet to 1 inch




### LONGITUDINAL SECTION

Showing Cross Vein

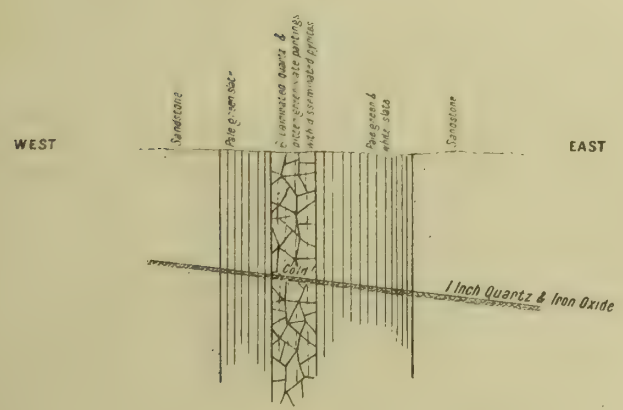
Scale, 60 feet to 1 inch




### TRANSVERSE SECTION

Showing Indicator & Cross Vein

Scale, 2 feet to 1 inch



# INDICATORS EAST OF ALMA

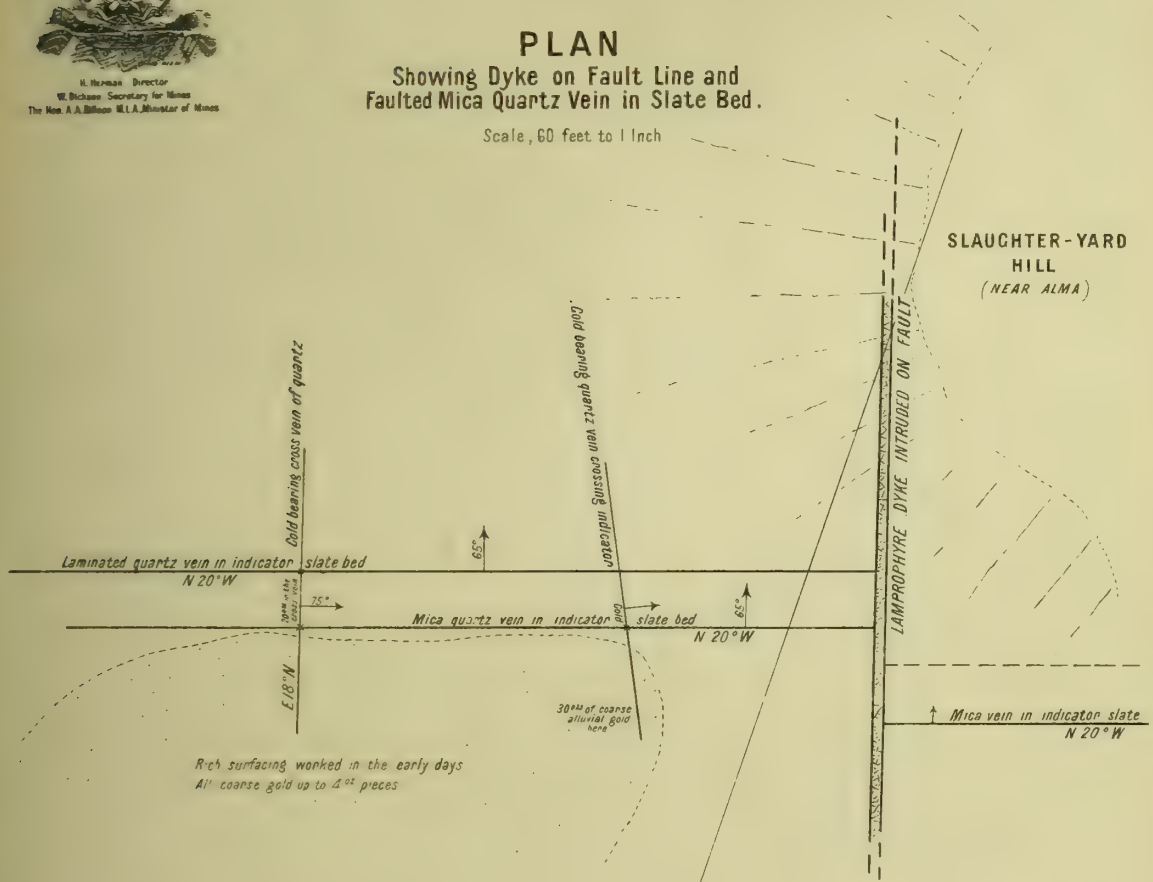
## MAIN INDICATOR BELT, EASTERN SERIES.

GEOLOGICAL SURVEY OF VICTORIA
H. Herman Director
W. Dickson Secretary for Mines
The Hon. A.A. Billson M.L.A. Minister of Mines

## PLAN

Showing Dyke on Fault Line and
Faulted Mica Quartz Vein in Slate Bed.

Scale, 60 feet to 1 Inch




20 23

PARISH OF MARYBOROUGH

ROAD

061m
v.12

1912.

VICTORIA.

DEPARTMENT OF MINES.

# MEMOIRS

OF THE

# GEOLOGICAL SURVEY OF VICTORIA

(E. J. DUNN, F.G.S., DIRECTOR);

ISSUED BY

W. DICKSON, SECRETARY FOR MINES, UNDER THE AUTHORITY OF THE HON. PETER McBRIDE, M.P., MINISTER OF MINES.

No. 12.

# LIST OF NUGGETS FOUND IN VICTORIA.

By Authority:
ALBERT J. MULLETT, ACTING GOVERNMENT PRINTER, MELBOURNE.
10919.—[Price, 1s.]

GEOLOGY LIBRARY

1912.

VICTORIA.

DEPARTMENT OF MINES.

# MEMOIRS

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# NOTES ON NUGGETS.

Gold is known as a royal metal; it is also a rare metal, because, although widely distributed, it is generally found in small quantities and in fine grains. Occasionally larger lumps or nuggets occur, and these have always created more interest than equal amounts of gold in a more divided form. Victoria has not only proved itself a land unusually rich in gold, but nuggets have been more lavishly distributed in this State than elsewhere, and in sizes that have never been exceeded.

In the early digging days the discovery of nuggets exercised a greater fascination than the wonderful yields of finer gold, and many a languishing rush has been rejuvenated by the finding of a nugget.

Owing to the conditions of life on the early gold-fields, it was more prudent to conceal the discovery of a large lump of gold than to publish it, and, in consequence, the records of nuggets are very incomplete, and it may safely be assumed that less than half of those found were recorded. Many nuggets were found by Chinamen, and accounts of these were rarely preserved. An occasional lump of gold chopped off a large mass was sold to gold-buyers, but details were seldom divulged. No systematic records were kept even of those that were made known, and hitherto there has been no complete list.

A list has been compiled from several different sources, and every endeavour has been made to bring together the essential data concerning all the nuggets that have been recorded and to eliminate such as are doubtful or that have been duplicated. The "Nugget Book" referred to in this list is a manuscript record that has been kept by the Mines Department. As regards the weights, they are in many cases approximate only, for they were frequently weighed in pounds avoirdupois in the early digging days. "Gross weight" refers to the total weight of gold, quartz, ironstone, and perhaps clay which together formed the nugget when discovered. "Net weight" is the total weight of the gold in the nugget. "Estimated weight" means the amount of gold assumed to be present after the gross weight has been determined, but before the gold was separated from the other constituents of the nugget. Both alluvial and quartz reef nuggets are dealt with. It is intended later on to publish a map showing the distribution of nuggets within the State, and plates of all the models. The bulk of the work in compiling the list has fallen on Mr. A. E. Smith.

Formerly an impression prevailed that alluvial nuggets resulted from the aggregation of gold while in the gravels, and that an originally small piece might increase in size and ultimately become a nugget. Such a theory is not borne out by an examination of the surfaces of alluvial nuggets, which invariably show much scratching and rounding, and the common occurrence of angular quartz with the gold does not favour such a view. Still further evidence against such a theory is the frequent discovery of very large masses of gold in quartz reefs, as at Ballarat and elsewhere. That all the large masses have not yet been found was proved a few years back, when a fine group of nuggets was obtained at Poseidon. Doubtless still more remain to be unearthed. Many nuggets are thoroughly rounded by the action of water; others are water-worn on one side only.

One of the prominent features about nuggets is that they are far more abundant in "indicator" country than elsewhere, such as the area between Ballarat on the south, Wedderburn on the north, Tarnagulla on the east, and Ararat on the west. Within this tract nearly all the nuggets have been obtained.

Mr. George Foord, chemist and assayer, demonstrated in the early sixties that in any nugget there was very little difference in the fineness of the gold in one part from that in another; but even if there were differences it would not be very remarkable, seeing that it is sometimes the case that in the same piece of quartz there are two distinct qualities of gold.

Professor Liversidge, formerly of Sydney University, sliced and etched many gold nuggets with interesting results. The experiments proved that the gold in nuggets was crystalline.

It is remarkable that some very heavy nuggets were found not resting on bedrock but sometimes several feet above it in the gravel. Such was the case with the Viscount Canterbury nugget, found at Rheola, as the famous Berlin rush is now named. On this field the gold was so coarse that washing the gravel was not resorted to. The top material—drift, gravel, clay, &c.—was stripped for 10 or 12 feet to the wash-dirt, and this latter was turned over with a long-handled shovel and thrown back. If there was any gold present it was either seen in the gravel or felt on the shovel. Large nuggets have been found lying on the surface of the rocks, as in the case of those found below the Matrix Reef, McIntyre's, which weighed 810 and 805 ozs. respectively. The largest of all—the Welcome Stranger nugget—was only a few inches below the surface, and was discovered in a rut cut by a dray wheel.

Although a large mass of gold would offer great resistance to running water when alone, on account of its high specific gravity, if associated with a considerable block of quartz the specific gravity of the whole would be greatly reduced, and then the two masses together might easily be conveyed long distances.

Nuggets were transported by the aborigines. No doubt the colour and lustre attracted their attention, but the great weight probably prevented them from carrying nuggets for very great distances. At Watchem a 40-oz. nugget was found at one of their myrniongs, or camping places. Between Mt. Tarrengower and the Loddon another nugget was found that was probably transported by the blacks. Many other nuggets have been found in such situations as to suggest that they had been brought there by human agency. Small nuggets have been found in Mallee hens' nests.

Quite commonly nuggets contain pieces of quartz or they are sometimes embedded in quartz; where in contact with the gold the quartz is always angular and just such as occurs in reefs, and not rounded and water-worn as would be the case if the gold had accumulated while in the alluvial deposits. Limonite frequently occurs associated with the gold of nuggets, sometimes with, at other times without, quartz. The limonite has resulted from the oxidation of iron pyrites that existed originally in the lode.

In the case of the Welcome Stranger nugget, the largest found in this State, there was 68 lbs. of quartz associated with the gold. A small sample of this quartz, shewn by Mr. Deason to the writer, was of a grey colour, and similar to what occurs in the Matrix Reef associated with the nuggets and rich patches along the intersection of the indicator and quartz veins.

Although there is no evidence that accretion of gold occurs so as to enlarge the size of nuggets in the drifts, there is ample proof that drift waters do contain gold in solution in some cases. It is also a remarkable fact that the clay near some of the large nuggets found at Poseidon contained impalpably fine crystalline particles of gold disseminated through it, as though the mass of gold had in some way influenced the deposition of this fine gold near it from solution. Nuggets are frequently stained with ferruginous clay, iron oxide, or manganese oxide.

There is a tragic side to nuggets also, for in the early digging days the sudden acquisition of more or less wealth in the form of a nugget often caused the mind of the finder to become unhinged. Crimes were also committed to obtain possession of nuggets.

E. J. DUNN.

31.8.12.

# LIST OF NUGGETS FOUND IN VICTORIA.

* Models in the Geological Museum.

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| *1 | A | 2,520 0 0 | 2,284 16 22 | .. | Black Lead, Moliagul | 1 inch | "The Welcome Stranger" | 5.2.1869 | John Deason and Richard Oates | F. Knox Orme, Warden, Nugget Book | The site of discovery is marked by a stone obelisk. The gold in this nugget was associated with 68 lbs. of quartz |
| 2 | A | 2,844 0 0 | 1,363 18 0 | .. | At Dunolly .. | .. | .. .. | —.10.1857 | .. .. .. | William Birkmyre, p. 362 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | In two nuggets. Associated with quartz |
| *3 | A | 2,217 16 0 | .. | 2,195 0 0 | Bakery Hill, Ballaarat | 180 feet | "The Welcome" | 15.6.1858 | Red Hill Mining Co... | W. Birkmyre, p. 361 R. B. Smyth's Gold-fields, &c. | Contained about 10 lbs. of quartz, clay, and oxide of iron |
| 4 | A | 1,743 13 0 | .. | .. | Kingower .. | 13 feet | "The Blanche Barkly" | 27.8.1857 | .. .. .. | W. Birkmyre, p. 362 R. B. Smyth's Gold-fields, &c. | Contained about 2 lbs. of quartz clay, and oxide of iron |
| *5 | A | 1,717 0 0 | .. | 1,621 2 0 | Catto's Paddock, Berlin | 12 feet | "The Precious" | 5.1.1871 | Ah Chang and party | F. K. Orme, Warden, Nugget Book | Not much waterworn |
| 6 | A | 1,619 0 0 | 1,319 1 12 | .. | Canadian Gully, Ballaarat | 60 feet | "The Canadian" | 31.1.1853 | .. .. .. | W. Birkmyre, p. 362 R. B. Smyth's Gold-fields, &c. | |
| 7 | A | 1,177 17 0 | .. | .. | Dalton's Flat, near Canadian Gully, Ballaarat | 135 feet | "The Lady Hotham" | 8.9.1854 | .. .. .. | W. Birkmyre, p. 363 R. B. Smyth's Gold-fields, &c. | Contained much quartz and iron. Also obtained from same hole 2,640 ozs. in smaller nuggets |
| 8 | A | 1,117 11 0 | .. | .. | Canadian Gully, Ballaarat | 60 feet | "The Sarah Sands" | 20.1.1853 | .. .. .. | W. Birkmyre, p. 363 R. B. Smyth's Gold-fields, &c. | Associated with quartz |
| *9 | A | 1,114 0 0 | .. | .. | Allotment No. 12, John's Paddock, Kangderaar | 8 feet | "Viscount Canterbury" | 31.5.1870 | Schlossman and Davis | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | 4 feet above the bottom, which was hornblende rock |
| 10 | A | 1,034 5 0 | .. | 833 14 0 | Blackman's Lead, Maryborough | 5 feet | .. .. | —.6.1855 | .. .. | W. Birkmyre, p. 363 R. B. Smyth's Gold-fields, &c. | |
| 11 | A | 1,011 15 0 | .. | .. | Canadian Gully, Ballaarat | 60 feet | .. .. | 22.1.1853 | .. .. .. | W. Birkmyre, p. 363 R. B. Smyth's Gold-fields, &c. | In the shape of a pyramid. Associated with very white quartz |
| 12 | A | 1,008 0 0 | 1,008 0 0 | .. | Near Old Golden Point, Fryer's Creek, Mt. Alexander | .. | "The Heron" .. | 29.3.1855 | .. .. .. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | A solid lump of gold |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | A | 1,000 0 0 | .. | .. | Christmas Flat, Rheola, Kangderaar | .. | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| *14 | A | 953 0 0 | 703 0 0 | .. | Poseidon, Tarnagulla | 10 inches | "The Poseidon" | 18.12.1906 | Woodall and party .. | A. M. Howitt, Records G.S., Vol. III., Part 1. | 2 inches above the bedrock. With much quartz |
| *15 | A | 912 0 0 | .. | .. | Allotment No. 21, John's Paddock, Kangderaar | 6½ feet | "Viscountess Canterbury" | 3.10.1870 | Felstead and party .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | 4 feet above the bedrock |
| 16 | A | 893 0 0 | .. | 893 0 0 | Langham Flat, Berlin, Kangderaar | 20 feet | .. .. | 12.3.1869 | Patrick and James Hoare | *Inglewood Advertiser* Newspaper, 19th March, 1869. Nugget Book | |
| 17 | A | 834 0 0 | .. | 834 0 0 | Ballaarat West .. | 100 feet | "The Koh-i-noor" | —.8.1860 | Koh-i-noor Mining Co. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | A solid lump of gold |
| 18 | A | 810 0 0 | .. | .. | McIntyre Diggings, Moliagul | Surface | "The McEvoy" | —.3.1857 | .. .. .. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | |
| 19 | A | 805 0 0 | .. | .. | No. 1 Gully, East of Matrix Reef, McIntyre's, Moliagul | 1 foot | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 20 | A | 801 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to —.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *21 | A | 795 19 0 | .. | 718 5 0 | Catto's Paddock, Berlin Flat, Kangderaar | 12½ feet | "The Kum Tow" | 17.4.1871 | Loo Ching and party | H. J. Hughes, Mining Registrar, Nugget Book | |
| 22 | A | 782 0 0 | .. | .. | McIntyre Diggings, Parish of Moliagul | .. | .. .. | —.2.1861 | .. .. .. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | |
| 23 | A | 715 0 0 | .. | .. | Daisy Hill, Township of Amherst | 3½ feet | .. .. | 22.10.1855 | .. .. .. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | |
| 24 | A | 708 0 0 | .. | .. | No. 1 Gully, East of Matrix Reef, McIntyre's, Moliagul | Surface | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| *25 | A | 675 0 0 | .. | .. | Poseidon, Tarnagulla | 15 inches | "The Leila" .. | 3.1.1907 | Smith, Stephenson, and Rogers | A. M. Howitt, Records G.S., Vol. III., Part 1. | 6 inches above the bedrock |
| 26 | A | 672 0 0 | .. | .. | Berlin .. .. | 12 feet | .. .. | 12.3.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 27 | A | 658 0 0 | .. | .. | McIvor, Heathcote | 16 feet | .. .. | —.10.1858 | .. .. .. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | |
| 28 | A | 648 0 0 | 648 0 0 | .. | Back Creek, Taradale | 12 feet | .. .. | —.5.1856 | .. .. .. | W. Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | A solid lump of gold |
| 29 | A | 645 0 0 | 571 0 0 | .. | McIvor, Heathcote | .. | .. .. | 12.10.1855 | .. .. .. | William Birkmyre, p. 364 R. B. Smyth's Gold-fields and Mineral Districts of Victoria | |
| 30 | A | 625 0 0 | .. | .. | Eureka, Ballaarat | .. | "The Lady Barkly" | 7.2.1854 | .. .. .. | William Birkmyre, p. 364 R. B. Smyth's Gold-fields and Mineral Districts of Victoria | Nearly free from quartz |
| 31 | A | 624 0 0 | .. | .. | Langham Flat, North of Gilmore's Gully, Kangderaar | 9 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| *32 | A | 617 0 0 | .. | .. | Sulky Gully, Parish of Ascot | 114 feet | "The Lady Loch" | 23.8.1887 | Midas Mining Co. .. | Mining Registrars' and Surveyors' Reports, September, 1887, p. 14 | |
| 33 | Q | 606 0 0 | .. | .. | Ballaarat .. | .. | "The Lady Don" | 12.11.1866 | The Lady Don Co. .. | Dicker's Mining Record, November, 1866, p. 298 | One of the first nuggets found in a reef |
| 34 | A | 600 0 0 | .. | .. | Allotment No. 14, Berlin Flat, Kangderaar | 12 feet | .. .. | 11.9.1869 | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 35 | A | 600 0 0 | .. | .. | Fryer's Creek, Parish of Fryers | Shallow | .. .. | 1854 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 71 | In shape like a leg of mutton |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Net. | Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 36 | A | 600 0 0 | .. | 575 17 0 | Parish of Yandoit | .. | .. .. | —.4.1860 | .. .. .. | William Birkmyre, p. 364 R. B. Smyth's Gold-fields, &c. | |
| 37 | A | 588 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 38 | A | 573 0 0 | .. | .. | White Horse Gully, Bendigo | 1 foot | .. .. | —.10.1852 | .. .. .. | William Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | Partly encrusted with quartz |
| 39 | A | 571 7 0 | .. | .. | Bakery Hill, Ballaarat | 185 feet | .. .. | 6.3.1855 | .. .. .. | William Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | Found 150 yards from the "Welcome" Nugget |
| 40 | A | 540 0 0 | .. | .. | Native Youth Flat, Black Hill, Ballaarat | 9 feet | "Nil Desperandum" | 29.11.1857 | .. .. .. | William Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | |
| *41 | A | 538 5 0 | .. | 478 0 0 | The Shoots Gully, between Dunolly and Jones' Creek | 3 feet | "The Schlemm" | 11.7.1872 | Henry Davey .. | F. K. Orme, Warden, Nugget Book | Associated with quartz and ironstone |
| 42 | A | 537 5 0 | .. | .. | Blackman's Lead, Parish of Maryborough | 6 feet | .. .. | 15.1.1858 | .. .. .. | William Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | |
| 43 | A | 528 0 0 | .. | .. | Christmas Flat, Rheola, Kangderaar | 6 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 44 | A | 524 5 0 | .. | 335 10 0 | Tarrengower .. | 18 feet | .. .. | 1856 | .. .. .. | William Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | |
| 45 | A | 520 0 0 | .. | .. | Nuggetty Gully, near Belgian Reef, Dunolly | 3 feet | .. .. | 1866 | .. .. | F. Knox Orme, p. 372, R. B. Smyth's Gold-fields, &c. | |
| 46 | A | 515 0 0 | .. | .. | Dunolly .. .. | .. | .. .. | —.10.1865 | .. .. .. | Dicker's Mining Record, October, 1865, p. 251 | |
| 47 | A | 512 0 0 | .. | 477 18 0 | Christmas Flat, Berlin, Kangderaar | 9 feet | .. .. | 8.5.1872 | Scott and Murphy .. | H. J. Hughes, Mining Registrar, Nugget Book | |
| *48 | A | 502 0 0 | .. | .. | Poseidon, Tarnagulla | 1¼ feet | "The Hazel" .. | 5.1.1907 | Smith, Stephenson, and Rogers | A. M. Howitt, Records G.S., Vol. III., Part 1. | A few inches above the bedrock |
| 49 | Q | 500 0 0 | 430 0 0 | .. | 1 mile from Bell Rock Claim, St. Arnaud | 20 feet | .. .. | —.10.1868 | J. Stewart and party | Dicker's Mining Record, October, 1868, p. 102 | |
| 50 | Q | 500 0 0 | .. | .. | On Baker's Creek, West of Moliagul Township | 54 feet | .. .. | .. | Snow and Liddel .. | O. A. L. Whitelaw, Progress Report No. XI., p. 15 | On indicator |
| 51 | Q | 500 0 0 | .. | .. | Ballaarat .. | 950 feet | .. .. | —.4.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 28th April, 1910 | On the indicator. Specimens |
| 52 | A | 500 0 0 | .. | .. | In Allotment No. 2, Catto's Paddock, Berlin, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 53 | A | 500 0 0 | .. | .. | White Horse Ranges, Ballaarat | 50 feet | .. .. | 25.12.1875 | .. .. .. | Progress Report No. IV., p. 49 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54 | A | 493 0 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | Shallow | .. .. | .. | .. .. .. | Mining Surveyor's Reports, p. 377 R. B. Smyth's Gold-fields, &c. | |
| 55 | A | 480 0 0 | .. | .. | Bakery Hill, Ballaarat | 185 feet | .. .. | -.3.1855 | .. .. .. | William Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | A solid lump of gold. Found in claim adjoining that in which No. 39 was found |
| 56 | A | 480 0 0 | .. | .. | Catto's Paddock, Berlin, Kangderaar | 12 feet | .. .. | —.9.1869 | Party of Chinese .. | Dicker's Mining Record, 11th September, 1869 | |
| 57 | Q | 480 0 0 | .. | 375 0 0 | Champion Reef, near Bobsem's Hill, Wedderburne | 35 feet | .. .. | 1902 | Noonan Bros. .. | O. A. L. Whitelaw, Memoir No. X., p. 25 | On an indicator |
| 58 | A | 480 0 0 | .. | .. | Guy's Rush, North of Orville, Moliagul | Surface | .. .. | 1869 | Brodie and party .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | Iron-stained nugget |
| *59 | A | 461 0 0 | .. | 422 0 0 | Ironbark Gully, Tarnagulla | 4½ feet | "Magnum Bonum" | 16.7.1889 | Charles Smith .. | H. Joyce, Nugget Book .. | Iron-stained nugget |
| 60 | A | 456 0 0 | .. | .. | Allotment No. 20, Fortunate Gully, Kangderaar | Shallow | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 61 | A | 452 17 0 | 442 15 0 | .. | McIntyre's, Moliagul | 4 inches | .. .. | 11.11.1870 | John Rogers and party | H. J. Hughes, Mining Registrar, Nugget Book | Flat |
| 62 | Q | 444 0 0 | .. | .. | Ballaarat .. | 753 feet | .. .. | —.1.1910 | Woah Hawp Canton Mining Co. | W. Baragwanath, jun. .. | On indicator |
| 63 | A | 440 0 0 | .. | .. | Spark's Gully, Moliagul | 12 feet | .. .. | 1859 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 64 | Q | 410 8 0 | .. | .. | Queen Victoria Lease, Ballaarat | 14 feet | .. .. | 25.12.1875 | Queen Victoria Mining Co. | W. Baragwanath, jun. .. | On indicator |
| 65 | A | 410 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. Knox Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 66 | A | 408 0 0 | .. | .. | The Twisted Gum Tree, Ballaarat | .. | .. .. | .. | .. .. .. | W. Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | |
| 67 | A | 396 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *68 | A | 387 0 0 | 322 10 0 | .. | Poseidon, Tarnagulla | 15 inches | "The Federal" .. | 12.12.1906 | Smith, Stephenson, and Rogers | A. M. Howitt, Records G.S., Vol. III., Part 1. | 2 inches above bedrock |
| *69 | A | 386 0 0 | 370 10 0 | .. | Dunolly .. .. | 161 feet | "The Burnt Creek" | 10.8.1888 | Burnt Creek Mining Co. | Nugget Book | |
| 70 | A | 384 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 71 | A | 384 0 0 | .. | .. | White Horse Gully, Eaglehawk | 8 to 10 feet | .. .. | 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 78 | |
| 72 | A | 384 0 0 | .. | .. | New Nuggetty Gully, Yandoit | Shallow | .. .. | Prior to 1869 | .. .. .. | Mining Surveyors' Reports, p. 378 R. B. Smyth's Gold-fields, &c. | |
| 73 | A | 381 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *74 | A | 377 6 0 | .. | .. | Robinson Crusoe Gully, Bendigo | .. | "The Platypus" | —.3.1861 | .. .. .. | W. Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | |
| 75 | A | 373 0 0 | 306 0 0 | .. | Poseidon, Tarnagulla | 15 inches | "The Christmas Box" | 18.12.1906 | Williamson and Stephenson | A. M. Howitt, Records G.S., Vol. III., Part 1. | 9 inches above bedrock |
| 76 | A | 371 2 0 | .. | .. | Canadian Gully, Ballaarat | 60 feet | .. .. | —.3.1853 | .. .. .. | W. Birkmyre, p. 365 R. B. Smyth's Gold-fields, &c. | Associated with much quartz |
| 77 | A | 368 0 0 | .. | .. | Canadian Gully, Ballaarat | 60 feet | .. .. | —.2.1853 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | |
| 78 | A | 361 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Net. | Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 79 | A | 360 0 0 | .. | .. | Clodhopper Gully, Moliagul | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Dunolly Report | |
| 80 | A | 360 0 0 | .. | .. | Blackman's Lead, Maryborough | About 34 feet | .. .. | 1854 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 154 | |
| 81 | A | 360 0 0 | .. | .. | Blackman's Lead, Maryborough | About 34 feet | .. .. | 1854 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 154 | |
| 82 | A | 360 0 0 | .. | | Nuggetty Gully, Amherst | Shallow | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377 R. B. Smyth's Gold-fields, &c. | |
| 83 | A | 360 0 0 | .. | .. | McIntyre's Gully No. 1, Moliagul | Shallow | .. .. | .. | .. .. .. | O. A. L. Whitelaw, Progress Report No. XI., p. 18 | |
| 84 | A | 360 0 0 | .. | .. | Christmas Flat, near Hard Hill, Dunolly | 15 feet | .. .. | .. | "The Old Cigar" .. | W. H. Ferguson's Dunolly Report | |
| 85 | Q | 353 10 0 | .. | 200 0 0 | Foster .. .. | 40 feet | .. .. | 14.12.1875 | No. 1 South Amalgamated Mining Co. | G. R. Murphy, Mining Registrar, Nugget Book | In a small quartz vein, with pyrites |
| 86 | A | 350 0 0 | .. | .. | Whipstick, Bendigo | 2½ feet | .. .. | —.2.1865 | .. .. .. | Dicker's Mining Record, Vol. IV., February, 1865, p. 252 | |
| 87 | A | 340 0 0 | .. | .. | White Horse Gully, Bendigo | .. | "The Victorian" | 20.9.1852 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | Purchased for £1,650 for presentation to Queen Victoria |
| 88 | A | 340 0 0 | .. | .. | Reach's Claim, Wedderburne | .. | .. .. | Prior to 1888 | .. .. .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | |
| 89 | A | 338 17 0 | .. | 314 0 0 | Bendigo .. .. | .. | .. .. | 1854 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | |
| *90 | A | 336 0 0 | .. | 330 0 0 | O'possum Point, Potter's Hill, Wedderburne | 12 feet | "The Opossum" | 7.5.1889 | Costo Cellevich .. | Nugget Book .. .. | Associated with quartz and iron stone |
| 91 | A | 336 0 0 | .. | .. | Langham Flat, Berlin, Kangderaar | 9 feet | .. .. | 15.6.1869 | J. F. Gardiner and Co. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | Flat in shape and waterworn. Nearly pure gold |
| *92 | A | 335 5 0 | 300 0 0 | .. | Star of the Loddon Mine, Newbridge, Tarnagulla | 102 feet | "Star of the Loddon" | 14.3.1906 | Star of the Loddon Mining Co. | A. M. Howitt, Records G.S., Vol. III., Part 2 | |
| 93 | A | 333 14 0 | .. | 197 14 0 | Christmas Flat, Berlin, Kangderaar | 9 feet | .. .. | 23.3.1871 | W. Brown and W. Collins | H. J. Hughes, Mining Registrar, Nugget Book | Nearly round, and associated with some quartz |
| 94 | A | 332 0 0 | 330 15 0 | .. | White Horse Gully, Bendigo | 1 foot | "The Dascombe" | —.1.1852 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | Nearly pure gold |
| 95 | A | 328 0 0 | .. | .. | McIvor Diggings, Heathcote | Shallow | .. .. | 1857 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | And several pieces, aggregating 35½ ozs., were found around this nugget. W. E. Adcock, p. 139 |
| 96 | A | 326 10 0 | .. | .. | McCallum's Creek, Amherst | .. | .. .. | .. | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | |
| 97 | A | 324 0 0 | .. | .. | Old Lead, Inkerman street, Dunolly Township | 40 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Report | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | A | 320 0 0 | .. | .. | Koh-i-noor Mine, Ballaarat | .. | "Sir Dominick Daly" | —.3.1862 | Koh-i-noor Mining Co. | Dicker's Mining Record, March, 1862, p. 16 | Named after His Excellency Sir Dominick Daly, who visited the claim |
| 99 | Q | 315 0 0 | .. | .. | Black Hill, Ballaarat | 400 feet | .. .. | 15.2.1876 | United Black Hill Mining Co. | D. Christy, Mining Registrar, Nugget Book | In five nuggets, the largest being 136 ozs. |
| 100 | A | 308 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 101 | A | 300 0 0 | .. | .. | Wattle Flat, Dunolly | About 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 102 | A | 300 0 0 | 300 0 0 | .. | Jones' Creek, Waanyarra | 1 foot | .. .. | —.10.1863 | .. .. .. | Dicker's Mining Record, October, 1863, p. 233 | Pure gold |
| 103 | Q | 300 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 feet | .. .. | 1910 | North Woah Hawp Mining Co. | W. Baragwanath, jun. .. | On indicator |
| 104 | A | 300 0 0 | .. | .. | Potato Diggings, Korong | 6½ inches | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 105 | A | 300 0 0 | .. | .. | McIntyre Diggings, Moliagul | 6 feet | .. .. | —.9.1858 | .. .. .. | W. Birkmyre, p. 366 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 106 | A | 300 0 0 | .. | .. | Billy Goat Gully, Kingower | 6 feet | .. .. | —.8.1861 | .. .. .. | W. Birkmyre, p. 366 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 107 | A | 297 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 108 | A | 296 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 109 | Q | 288 0 0 | .. | 180 0 0 | Argus Mine, Sailor's Gully, Sandhurst | 320 feet | .. .. | 9.6.1870 | Argus Mining Co. .. | N. G. Stephens, Mining Registrar, Nugget Book | Associated with quartz, pyrites, and galena |
| 110 | A | 288 0 0 | .. | .. | Clover's Gully, Dunolly | Shallow | .. .. | 1862 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 111 | A | 288 0 0 | .. | .. | Fortunate Gully, Kangderaar | Shallow | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 112 | A | 288 0 0 | .. | .. | Bendigo .. .. | .. | .. .. | 1852 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | |
| 113 | A | 286 0 0 | .. | .. | Berlin Rush, Kangderaar | 5 feet | .. .. | —.11.1868 | A shepherd .. | Dicker's Mining Record, November, 1868, p. 107 | |
| 114 | A | 282 2 0 | .. | 162 16 0 | Kingower .. | .. | .. .. | 1854 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | |
| 115 | A | 281 10 0 | .. | .. | Union Jack Gully, Buninyong | .. | .. .. | 28.2.1857 | .. .. .. | J. W. Gregory, Memoir No. IV., p. 7 | |
| 116 | A | 281 10 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | Shallow | .. .. | —.4.1861 | .. .. .. | W. Birkmyre, p. 366 R. B. Smyth's Gold-fields, &c. | |
| 117 | A | 281 0 0 | .. | .. | Jones' Creek, Waanyarra | Shallow | .. .. | 1856 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | |
| 118 | A | 280 0 0 | .. | .. | North of Township of Moonambel, Parish of Warrenmang | Shallow | .. .. | .. | .. .. .. | A. M. Howitt, Monthly Progress Report, No. III., p. 8 | |
| 119 | A | 277 0 0 | .. | .. | New Nuggetty Gully, Yandoit | Shallow | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 378 R. B. Smyth's Gold-fields, &c. | With many smaller nuggets |
| 120 | A | 276 0 0 | .. | 267 0 0 | Nuggetty Gully, Fryerstown | 4 feet | .. .. | 1855 | J. Corbett .. .. | Mark Amos, Mining Surveyor, Nugget Book | With a little quartz |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Net. | Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 121 | A | 275 13 0 | .. | .. | Splitter's Gully, Whipstick, Bendigo District | 5 feet | .. .. | —.3.1868 | A German, named "Jacob" | Dicker's Mining Record, March, 1868, p. 71 | Almost pure gold, with a little ironstone |
| 122 | A | 270 0 0 | .. | .. | Potter's Hill, Wedderburne | Surface | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | |
| 123 | Q | 266 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | About 800 feet | .. .. | —.11.1910 | Woah Hawp Canton Mining Co. | *Age* Newspaper, November 25th, 1910 | In nuggets, for fortnight. On indicator |
| 124 | A | 266 0 0 | .. | .. | Berlin, Kangderaar | 12 feet | .. .. | —.3.1870 | .. .. .. | Dicker's Mining Record, March 26th, 1870 | |
| 125 | A | 264 0 0 | .. | .. | Near Old Golden Point, Fryer's Creek | .. | .. .. | About 1852 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | |
| 126 | A | 264 0 0 | .. | .. | Old Lead, Dunolly | 20–40 feet | .. .. | —.4.1868 | .. .. .. | Dicker's Mining Record, April, 1868, p. 147 | |
| 127 | A | 264 0 0 | .. | .. | No. 2 Gully, East of McIntyre's Ranges, Moliagul | Shallow | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 128 | A | 263 8 0 | .. | .. | Brown's Diggings, Scarsdale | .. | .. .. | 23.10.1856 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | |
| 129 | Q | 262 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. .. | —.7.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, July 5th, 1909 .. | In nuggets, for week. On indicator |
| *130 | A | .. | .. | 260 0 0 | Daylesford .. | .. | .. .. | 7.2.1900 | .. .. .. | Nugget Book | |
| 131 | A | 260 0 0 | .. | .. | Kingower .. | 4 feet | .. .. | —.5.1856 | .. .. .. | W. Birkmyre, p. 367 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 132 | A | 260 0 0 | .. | .. | Berlin, Kangderaar | 12 feet | .. .. | —.3.1870 | .. .. .. | Dicker's Mining Record, March 26th, 1870 | |
| 133 | A | 259 12 12 | .. | .. | Daisy Hill, Amherst | Shallow | .. .. | 1856 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | |
| 134 | Q | 257 0 0 | 130 0 0 | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. .. | —.8.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, August 10th, 1909 | On indicator |
| 135 | A | 256 0 0 | .. | .. | Christmas Flat, Rheola, Kangderaar | 6 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June,1890, p. 16 | |
| 136 | A | 254 0 0 | .. | .. | 3¾ miles from Dunolly | .. | .. .. | —.10.1865 | .. .. .. | Dicker's Mining Record, October, 1865, p. 280 | |
| *137 | A | 252 0 0 | 200 0 0 | .. | Poseidon Lead, Tarnagulla | 6 feet | "Little Jack" .. | 4.2.1907 | Jackson and Hughes | A. M. Howitt, Records G.S., Vol. III., p. 11 | Containing much quartz |
| 138 | A | 251 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *139 | A | 250 15 0 | 237 0 0 | .. | Kitty's Lead, Buninyong | Shallow | .. .. | 11.7.1878 | Benjamin Betts .. | Progress Report No. VI., p. 35 | |
| 140 | Q | 250 0 0 | .. | .. | Ballaarat .. | .. | .. .. | 1889 | Tinworth's party .. | W. Baragwanath, jun. .. .. | From the indicator |
| *141 | A | 249 0 0 | .. | 246 16 0 | Catto's Paddock, Berlin, Kangderaar .. | 12 feet | "The Needful" | 10.5.1871 | Gardiner and party .. | H. J. Hughes, Mining Registrar, Nugget Book | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 142 | Q | 245 9 0 | .. | 196 7 0 | Ballaarat .. | 310 feet | .. .. | 8.12.1876 | Parade Mining Co. .. | Progress Report No. V., p. 43 .. | Close to line of indicator |
| 143 | A | 244 10 0 | .. | .. | Gilmore's Gully, Berlin, Kangderaar | 20 feet | .. .. | 3.3.1869 | .. .. .. | Mining Surveyor "Mason," Nugget Book | |
| 144 | A | 243 0 0 | .. | .. | Kangaroo Gully, Bendigo | Shallow | .. .. | Prior to —.6.1862 | A Welshman, named Jones | J. A. Patterson, The Gold-fields of Victoria 1862, p. 66 | |
| *145 | A | 242 17 6 | .. | .. | Kangaroo Gully, Bendigo | 9 feet | "The Beauty" | 1858 | .. .. .. | Nugget Book | |
| 146 | A | 242 0 0 | .. | .. | Baron Rothschild's Claim, Spring Hill, Creswick | 242 feet | .. .. | —.9.1875 | .. .. .. | Mining Registrars' and Surveyors' Reports, September, 1875 | |
| 147 | A | 240 18 0 | .. | 167 18 0 | Mount Blackwood, Parish of Blackwood | On surface | .. .. | 1855 | .. .. .. | W. Birkmyre, p. 367 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | Associated with quartz and ironstone |
| 148 | A | 240 0 0 | .. | .. | Langham Flat, Berlin, Kangderaar | 9 feet | .. .. | —.3.1869 | .. .. .. | Dicker's Mining Record, March 29th, 1869 | |
| 149 | Q | 240 0 0 | .. | 170 0 0 | Head of Welcome Gully, Parish of Franklin, Dayles-ford | 35 feet | .. .. | 1.9.1894 | White and Jackson .. | W. Trenkner, Mining Registrar, Nugget File | On an indicator |
| 150 | A | 240 0 0 | .. | .. | Clover's Gully, Dunolly | 14 feet | .. .. | 1862 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 151 | A | 240 0 0 | .. | .. | Cleeland's Gully, West of John's Paddock, Kangderaar | Shallow | .. .. | About 11.9.1869 | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 152 | A | 240 0 0 | .. | .. | Tyler's Flat, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 153 | A | 240 0 0 | .. | .. | Old Lead, Dunolly | 20–40 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 154 | A | 240 0 0 | 240 0 0 | .. | Yandoit .. .. | 20 feet | .. .. | 1860 | .. .. .. | W. Birkmyre, p. 367, R. B. Smyth's Gold-fields, &c. | A solid lump of gold |
| 155 | A | 238 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *156 | A | 238 0 0 | .. | .. | Poseidon United Claim, Poseidon, Tarnagulla | 85 feet | .. .. | —.8.1910 | Poseidon United Mining Co. | *Age* Newspaper, August 11th, 1910 | |
| 157 | A | 236 0 0 | 236 0 0 | .. | White Hills, Maryborough | 12 feet | .. .. | 1856 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | A solid lump of gold |
| 158 | A | 236 0 0 | .. | .. | Hard Gully, Kingower | Surface | .. .. | —.2.1861 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | |
| 159 | Q | 230 0 0 | .. | .. | Woah Hawp Canton Mine, Ballarat | 753 or 930 feet | .. .. | 1910 and 1911 | Woah Hawp Canton Mining Co. | W. Baragwanath, jun. .. | On indicator |
| 160 | Q | 230 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 to 945 feet | .. .. | —.1.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, January 13th, 1910 | On indicator |
| 161 | A | 230 0 0 | 188 15 0 | .. | Kingower .. | On surface | .. .. | —.5.1860 | .. .. .. | W. Birkmyre, p. 367 R. B. Smyth's Gold-fields, &c. | |
| 162 | A | 229 0 0 | .. | .. | Eureka Lead, Ballaarat | Deep | "The Sleeping Beauty" | 19.12.1862 | Confederate party .. | W. Baragwanath, jun. .. | Nearly pure gold |
| 163 | A | 228 0 0 | .. | .. | On road between Allotments Nos. 12 and 21, John's Paddock, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 164 | A | 225 0 0 | .. | .. | Berlin Diggings, Kingower | 12 feet | | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. B. Smyth's Gold-fields, &c. | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 165 | A | 224 0 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | .. | .. | .. | .. | Mining Surveyors' Reports, p. 377 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | Amongst several other nuggets |
| 166 | A | 220 0 0 | .. | .. | Inkerman, Dunolly | 14 feet | .. | 1856 | .. | F. K. Orme, p. 372 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| *167 | A | 216 0 0 | .. | 215 0 0 | New Nuggetty Gully, Parish of Campbelltown | 12 feet | .. | 26.7.1895 | G. Brown .. | Nugget Book | |
| 168 | A | 216 0 0 | .. | .. | Catto's Paddock, Berlin Flat, Kangderaar | 12 feet | .. | —.2.1871 | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 169 | A | 216 0 0 | .. | .. | Old Lead, Dunolly | 30 feet | .. | 1867 | .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | Amongst several other nuggets, some of which were obtained from 5 to 10 feet above the bottom |
| 170 | A | 216 0 0 | 178 10 0 | .. | Prince of Wales Claim, Ballaarat | .. | .. | —.12.1865 | .. | Dicker's Mining Record, December, 1865, p. 364 | A specimen. This mine was working both quartz and alluvial at this date |
| 171 | A | 215 0 0 | 200 0 0 | .. | Green Gully, about 8 miles South of Fryerstown, Parish of Holcombe | 27 feet | .. | —.6.1870 | .. | Mining Registrars' and Surveyors' Reports, June, 1870, p. 35 | On a pipe-clay bottom |
| 172 | A | 212 0 0 | .. | 209 0 0 | Tyler's Rush, Berlin, Kangderaar | 9 feet | .. | 12.1.1870 to 24.3.1870 | .. | F. Knox Orme, Warden, Nugget Book | |
| 173 | A | 207 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | Prior to 21.10.1868 | .. | F. Knox Orme, p. 374 R. Brough Smyth's Gold-fields, &c. | |
| *174 | A | 206 5 0 | .. | About 104 0 0 | Wragge Bros.' Claim, Poseidon, Tarnagulla | 11 feet | "The Port Arthur" | 1.2.1907 | Wragge Bros. | A. M. Howitt, Records, Vol. III., Part 1. | Contained much quartz, and was found on the bottom |
| 175 | A | 204 0 0 | .. | .. | Nuggetty Gully, Dunolly | 3 feet | .. | 1866 | .. | F. K. Orme, p. 373, R. Brough Smyth's Gold-fields, &c. | |
| 176 | A | 204 0 0 | .. | .. | Potter's Hill, Wedderburne | Surface | .. | .. | .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | |
| 177 | A | 204 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | .. | W. H. Ferguson's Quarter-Sheet Map, No. 53D, S.W. | |
| 178 | A | 202 0 0 | .. | .. | Break-of-Day Gully, Rokewood | 20 feet | .. | —.12.1865 | Unabolished Company's Claim | Dicker's Mining Record, December, 1865, p. 389 | |
| *179 | A | .. | .. | 201 16 0 | Near Inglewood .. | .. | "The Inglewood" | —.1.1881 | .. | Bank of N.S.W., Inglewood, Nugget Book | |
| 180 | A | 200 15 0 | 200 15 0 | .. | Tyler's Diggings, Berlin, Kangderaar | .. | .. | —.11.1869 | .. | F. Knox Orme, Warden, Nugget Book | Pure gold |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 181 | A | .. | .. | 200 0 0 | Green Gully, Middleton Creek, near Glenlyon | 27 feet | .. | .. | —.5.1870 | .. .. .. | T. L. Brown, Mining Surveyor, Nugget Book | Flat in shape |
| 182 | Q | 200 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 feet | .. | .. | —.3.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, March 7th, 1910 | On indicator |
| 183 | Q | 200 0 0 | .. | .. | Woah Hawp Canton, Ballaarat | 950 feet | .. | .. | —.9.1910 | Woah Hawp Canton Mining Co. | *Age* Newspaper, September 2nd, 1910 | On indicator |
| 184 | A | 200 0 0 | .. | .. | Wattle Flat, Dunolly | 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 185 | A | 200 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 186 | A | 198 0 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | Shallow | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 187 | A | 197 0 0 | .. | .. | New Year's Flat, Dunolly | 14 feet | .. | .. | 1857 | .. .. .. | F. Knox Orme, p. 372 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 188 | A | 197 0 0 | 169 18 0 | .. | Saw Pit Gully, Kingower | 2 feet | .. | .. | 18.6.1883 | Simon Stephens .. | Progress Report No. VII., p. 126 | Associated with quartz |
| 189 | A | 196 0 0 | .. | .. | Near Italian Point, Wedderburne | Shallow | .. | .. | 1859 | F. Gallyer .. .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 190 | Q | 194 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.6.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, June 23rd, 1909 | On indicator |
| 191 | A | 192 0 0 | .. | .. | Catto's Paddock, Berlin, Kangderaar | About 12 feet | .. | .. | —.9.1869 | Party of Chinese .. | Dicker's Mining Record, September, 1869 | |
| 192 | A | 192 0 0 | .. | .. | Christmas Flat, Hard Hill, Dunolly | About 20 feet | .. | .. | .. | Douglas O'Neil and party | W. H. Ferguson | |
| 193 | A | 192 0 0 | .. | .. | Ironbark Gully, Wedderburne | Shallow | .. | .. | 1859 | .. .. .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 194 | A | 192 0 0 | .. | .. | Italian Point, Wedderburne | Shallow | .. | .. | 1859 | F. Gallyer .. .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| *195 | A | .. | .. | 191 0 0 | Rokewood .. | .. | .. | .. | —.2.1900 | .. .. .. | Nugget Book | |
| 196 | Q | 190 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.12.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, December 3rd, 1910 | On indicator |
| 197 | A | 190 0 0 | .. | .. | Whipstick, Bendigo | 2½ feet | .. | .. | —.2.1865 | A boy named Jeremiah Fullerton | Dicker's Mining Record, February, 1865, p. 252 | |
| 198 | A | 190 0 0 | .. | .. | Spring Gully, Fryer's Creek, Fryers | .. | .. | .. | —.2.1865 | .. .. .. | Dicker's Mining Record, February, 1865, p. 330 | |
| 199 | A | 187 5 0 | 178 18 0 | .. | Break-of-Day Mine, Rokewood | 30 feet | .. | .. | —.9.1878 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | Found about 100 feet from the "Christmas Gift" |
| 200 | A | 186 15 0 | .. | .. | Break-of-Day Mine, Rokewood | 10 to 15 feet | .. | .. | 4.4.1867 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 201 | A | 183 8 12 | .. | .. | Bryant's Ranges, Tarrengower | On surface | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 367 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 202 | A | 180 0 0 | .. | .. | Potter's Hill, Wedderburne | On surface | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | |
| 203 | Q | 180 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.4.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, April 22nd, 1910 | On indicator |
| 204 | A | 180 0 0 | .. | .. | Tarrengower .. | .. | .. | .. | —.5.1855 | .. .. .. | W. Birkmyre, p. 367 R. Brough Smyth's Gold-fields, &c. | |
| 205 | Q | .. | 180 0 0 | .. | Argus Mine, Specimen Hill, Bendigo | 320 feet | .. | .. | .. | Argus Mining Co. .. | Nugget Book .. .. | In the centre of a spur, and associated with galena and pyrites |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 206 | A | 180 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. .. | 1860 | .. .. .. | F. Knox Orme, p. 372 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 207 | A | 180 0 0 | .. | .. | Allotment No. 12, John's Paddock, Kangderaar | 9 feet | .. .. | —.10.1868 | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16; and Dicker's Mining Record, October, 1868, p. 93 | |
| 208 | A | 180 0 0 | .. | .. | Graveyard Hill, Burnt Creek, Dunolly | 10 feet | .. .. | 1855 | .. .. .. | F. K. Orme, p. 372 R. Brough Smyth's Gold-fields, &c. | |
| 209 | A | 180 0 0 | .. | .. | Possum Hill Lead, Orville, Moliagul | Surface | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 210 | A | 180 0 0 | .. | .. | New Year's Flat, Dunolly | 12 feet | .. .. | 1857 | .. .. .. | F. K. Orme, p. 372 R. Brough Smyth's Gold-fields, &c. | |
| 211 | Q | 180 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. .. | —.8.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, August 16th, 1909 | On indicator |
| *212 | A | 179 0 0 | .. | 176 8 0 | John's Paddock, Berlin, Kangderaar | 2 feet | "The Crescent" | 2.4.1872 | Archibald Gray .. | Walter Smith, Member of Mining Board, Nugget Book; and E. J. Dunn, Quarterly Report, June, 1890, p. 16 | Found in red clay |
| *213 | A | 178 18 12 | .. | .. | Break-of-Day, Rokewood | 40 feet | "Little Highlander" | 18.7.1878 | Turner and party .. | G. Perry, Mining Registrar, Nugget Book | Found about 100 feet from the "Christmas Gift" |
| 214 | A | 178 16 0 | .. | .. | Maryborough .. | .. | .. .. | 1854 | .. .. .. | W. Birkmyre, p. 368 R. Brough Smyth's Gold-fields, &c. | Associated with quartz and ironstone |
| 215 | Q | 177 0 0 | .. | .. | McIntyre, Berlin, Moliagul | .. | .. .. | —.7.1910 | Cain and party .. | *Age* Newspaper, July 14th, 1910 | On indicator |
| 216 | A | 177 0 0 | .. | .. | Berlin, Kangderaar | .. | .. .. | —.3.1870 | .. .. .. | Dicker's Mining Record, March, 1870 | |
| 217 | A | 176 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 13 feet | .. .. | 20.3.1907 | Cox and Newitt .. | A. M. Howitt | |
| 218 | A | 176 0 0 | .. | .. | Red Jacket Gully, Whipstick, Bendigo | .. | .. .. | —.11.1863 | .. .. .. | Dicker's Mining Record, November, 1863; p. 248; and *Bendigo Advertiser* Newspaper | Exhibited at Oriental Bank, Eaglehawk |
| *219 | A | 175 12 0 | .. | 170 0 0 | Eldorado Gold Mine, Smythesdale | 155 feet | "The Eldorado" | 26.8.1873 | Eldorado Mining Co. | John Lynch, Mining Surveyor, Nugget Book | 6 inches above bedrock. Absence of fine or other gold around it |
| *220 | A | 175 0 0 | .. | 162 0 0 | Break-of-Day, Rokewood | 29 feet | "The Christmas Gift" | 12.12.1877 | Turner and party .. | Progress Report No. VI., p. 35 | |
| 221 | A | 175 0 0 | .. | .. | Hard Hill, Dunolly | .. | .. .. | —.12.1881 | .. .. .. | Mining Registrars' and Surveyors' Reports, December, 1881, pp. 36 and 37 | |
| 222 | A | 175 0 0 | .. | 169 0 0 | Nuggetty Gully, Fryer's Creek | 2½ feet | .. .. | 3.2.1865 | William Fullarton .. | Mark Amos, Mining Surveyor, Nugget Book | |
| 223 | A | 174 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. .. | Prior to 31.12.1868 | .. .. .. | F. Knox Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 224 | A | 174 0 0 | 100 0 0 | .. | Gibraltar, Majorca | 70 feet | .. | .. | .. | .. | .. | Mining Surveyors' Reports, p. 376 R. Brough Smyth's Gold-fields, &c. | The gold and quartz curiously mingled |
| 225 | A | 173 12 0 | 160 0 0 | .. | Adelaide Lead, Mole's Dam, Maryborough | 25 feet | .. | .. | 15.10.1869 | Thomas Mole .. | P. Virtue, jun., Mining Registrar, Nugget Book | | Flat, and on indicator line, with several other nuggets |
| 226 | A | 172 0 0 | .. | 152 0 0 | Near Newstead .. | 50 feet | .. | .. | —.12.1865 | .. .. .. | Dicker's Mining Record, December, 1865, p. 389 | | Associated with quartz |
| 227 | A | 172 0 0 | .. | .. | Ironbark Gully, Bendigo | 8 to 10 feet | .. | .. | 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 81 | | |
| 228 | Q | 170 0 0 | .. | 85 0 0 | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.4.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, April 25th, 1910 | | On indicator |
| 229 | Q | 170 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.10.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, October 4th, 1909 | | On indicator. Nearly pure gold |
| 230 | A | 170 0 0 | 170 0 0 | .. | Berlin, Kangderaar | 1 foot | .. | .. | 9.8.1870 | P. Lorimer and party | F. K. Orme, Warden, Nugget Book | | Found in red clay. All gold |
| 231 | A | 170 0 0 | .. | .. | Gooseberry Hill, Dunolly | 50 feet | .. | .. | 1866 | .. .. .. | F. Knox Orme, p. 373 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | | |
| 232 | A | 168 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. | .. | 1867 | .. .. .. | F. Knox Orme, p. 373 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | | Coarse red drift |
| 233 | A | 168 0 0 | .. | .. | At foot of the Hard Hill, Dunolly | 16 feet | .. | .. | 1857 | .. .. .. | F. Knox Orme, p. 372 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | | Found in gravelly clay |
| 234 | A | 168 0 0 | .. | .. | Milkmaid's Flat, Dunolly | 6 feet | .. | .. | 1863 | .. .. .. | F. Knox Orme, p. 372 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | | |
| 235 | Q | 168 0 0 | .. | .. | Knowles' Dyke, Wood's Point | .. | .. | .. | .. | Rogers and party .. | O. A. L. Whitelaw | | |
| 236 | A | 168 0 0 | .. | .. | Junction of Snake Gully and Old Lead, Dunolly | About 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | | |
| *237 | A | 167 5 0 | .. | .. | Midas Mine, Sulky Gully, Dowling Forest, Ascot | 114 feet | "Lady Brassey" | | 4.6.1887 | Midas Mining Co. .. | James Stevenson, Mining Registrar's Report, June, 1887, p. 12 | | |
| 238 | A | 167 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | | In coarse drift, amongst nuggets, from 5 to 10 feet above bedrock |
| 239 | Q | 167 0 0 | .. | 100 0 0 | Woah Hawp Canton Mine, Ballaarat | 950 feet | .. | .. | —.11.1910 | Woah Hawp Canton Mining Co. | *Age* Newspaper, November 18th, 1910 | | On indicator |
| 240 | A | 166 10 0 | .. | 29 0 0 | No locality given .. | .. | .. | .. | 1853 | .. .. .. | William Birkmyre, p. 368 R. Brough Smyth's Gold-fields, &c. | | |
| 241 | A | 163 0 0 | .. | 136 6 0 | German Gully, Craigie | 4 feet | .. | .. | 27.8.1872 | Henry Austin .. | J. Smith, Mining Surveyor, Nugget Book | | |
| 242 | A | 162 0 0 | .. | .. | Berlin, Kangderaar | 2 feet | .. | .. | 13.8.1870 | P. Lorimer .. | Nugget Book | | |
| 243 | A | 162 0 0 | 162 0 0 | .. | Power's Gully, Berlin, Kangderaar | Shallow | .. | .. | —.1.1869 | .. .. .. | Dicker's Mining Record, January, 1869 | | All gold |
| 244 | A | 161 6 0 | .. | 152 8 12 | Napoleon's, Buninyong | 175 feet | .. | .. | 29.11.1873 | Slow and Sure Mining Co. | Progress Report No. II., p. 58 | | |
| 245 | A | 161 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. Knox Orme, p. 374 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | | |
| 246 | A | 161 0 0 | .. | .. | Union Gold Mine, Mt. Greenock, Amherst | 450 feet | .. | .. | 4.10.1878 | .. .. .. | Progress Report No. VI., p. 35 | | |
| 247 | A | 160 0 0 | .. | .. | New Nuggetty Gully, Yandoit | 15 feet | .. | .. | 10.2.1902 | .. .. .. | Nugget Book .. .. | | Close to several other large nuggets |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 248 | A | 158 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 249 | Q | 157 0 0 | .. | .. | Catherine United, Bendigo | 1,136 feet | .. .. | —.4.1909 | A party of Tributers .. | *Age* Newspaper, April 24th.1909 | |
| 250 | Q | 156 0 0 | .. | 120 0 0 | Head of Welcome Gully, Parish of Franklin, Daylesford | 20 feet | .. .. | 13.2.1894 | White and Jackson .. | W. Trenkner, Mining Registrar, Nugget File | From an indicator |
| 251 | A | 156 0 0 | .. | .. | Allotment No. 2, Catto's Paddock, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 252 | A | 156 0 0 | .. | .. | No. 3 Gully, McIntyre's, Moliagul | Surface | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 253 | A | 156 0 0 | .. | .. | Ironbark Gully, Wedderburne | Shallow | .. .. | 1868 | Riley and Murphy .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 254 | A | 156 0 0 | .. | 129 0 0 | Smythesdale .. | 6 feet | .. .. | 31.1.1873 | Richard Scott .. | Nugget Book .. .. | Associated with quartz and ironstone |
| *255 | Q | 155 10 0 | .. | 130 0 0 | Eureka Gully, Jordans | 8 feet | "Spondulix" .. | —.11.1872 | Wilton and party .. | W. Nicholas, Nugget Book .. | Associated with quartz and ironstone |
| 256 | A | 152 0 0 | 120 0 0 | .. | Poseidon, Tarnagulla | 4 feet | "Little Ben" .. | 14.12.1906 | Jackson and Hughes | A. M. Howitt, Records G.S., Vol. III., Part I. | 1 foot above the bedrock |
| 257 | A | 152 0 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | Shallow | .. .. | 1861 | .. .. .. | Mining Surveyors' Reports, p. 377 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 258 | A | 150 0 0 | .. | .. | Junction of Three-Grain Gully and Burnt Creek, Dunolly | Under 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 259 | A | 150 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 260 | Q | 150 0 0 | .. | .. | Woah Hawp Canton, Ballaarat | 850 feet | .. .. | —.9.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, September 29th, 1909 | On indicator |
| 261 | Q | 150 0 0 | .. | .. | Woah Hawp Canton, Ballaarat | About 843 feet | .. .. | 1910 and 1911 | Woah Hawp Canton Mining Co. | W. Baragwanath, jun. .. | On indicator |
| 262 | A | 148 10 0 | 120 0 0 | .. | Poseidon, Tarnagulla | 1 foot | .. .. | 19.2.1907 | Bravo and Leighton | A. M. Howitt, Records G.S., Vol. III., Part I. | 3 feet from the "Groper" |
| 263 | A | 148 0 0 | 114 0 0 | .. | Nuggetty Gully, Talbot | 52 feet | .. .. | 28.4.1897 | Dunning and party .. | A. Roffey, Mining Registrar, Nugget File | |
| 264 | A | 146 0 0 | 126 5 0 | .. | Poseidon, Tarnagulla | 1½ feet | "The Groper" .. | 16.2.1907 | Bravo and Leighton | A. M. Howitt, Records G.S., Vol. III., Part I. | 2½ feet above the bedrock |
| *265 | A | 145 14 0 | .. | 136 0 0 | Alma Consols Mine, Maryborough | 120 feet | "Alma No. 1" | 14.4.1873 | Alma Consols Mining Co. | P. Virtue, Mining Registrar, Nugget Book | Impregnated with quartz and black cement |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 266 | A | 145 5 0 | .. | .. | Jones' Creek, Waanyarra | .. | .. .. | 1855 | .. .. .. | W. Birkmyre, p. 368 R. B. Smyth's Gold-fields, &c. | |
| 267 | A | 145 0 0 | .. | 141 10 0 | Tyler's Rush, Berlin, Kangderaar | .. | .. .. | 12.1.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 268 | A | 144 0 0 | .. | .. | Possum Point, Wedderburne | .. | .. .. | 1854 | T. W. Cosh .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 269 | A | 144 0 0 | .. | 102 0 0 | Creswick Creek, Creswick | .. | .. .. | —.5.1860 | .. .. .. | W. Birkmyre, p. 368 R. B. Smyth's Gold-fields, &c. | |
| 270 | A | 144 0 0 | .. | .. | Kitty's Lead, Buninyong | .. | .. .. | —.3.1873 | .. .. .. | Mining Registrars' and Surveyors' Reports, March, 1873, p. 26 | Found amongst other nuggets |
| 271 | A | 144 0 0 | .. | .. | Canadian Gully, Ballaarat | 60 feet | .. .. | 1874 | .. .. .. | W. Barngwanath, jun. .. | Same locality as the Nugget No. 77, of 368 ounces, was found |
| 272 | A | 144 0 0 | .. | .. | Wattle Flat, Dunolly | About 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 273 | A | 144 0 0 | .. | .. | Pensam's Gully, Old Lead, Dunolly | 10 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 273A | A | 144 0 0 | .. | .. | Corinella Mine, Egansstown, Daylesford | About 40 to 50 feet | .. .. | 1900 to 1902 | Corinella Mining Co. | W. H. Ferguson | |
| 274 | A | 143 15 0 | .. | .. | Canadian Gully, Bakery Hill, Ballaarat | 60 feet | .. .. | —.2.1853 | .. .. .. | W. Birkmyre, p. 368 R. Brough Smyth's Gold-fields, &c. | Found near to where "Welcome" Nugget was found |
| 275 | A | 143 13 0 | .. | 135 0 0 | Webbville, Buninyong | 145 feet | .. .. | 2.8.1869 | Skewes and party .. | J. G. Taylor, Warden, Nugget Book | Rough, irregular, and slightly waterworn |
| 276 | A | 143 0 0 | 140 0 0 | .. | George's Lead, Alma, Wareek | 1 foot | .. .. | .. | .. .. .. | A. M. Howitt.. .. .. | On line of Rowle's indicator |
| 277 | A | 141 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 278 | A | 140 0 0 | .. | 126 0 0 | Jones' Creek, Waanyarra | 20 feet | .. .. | .. | .. .. .. | W. Birkmyre, p. 368 R. B. Smyth's Gold-fields, &c. | |
| 279 | A | 139 9 0 | .. | .. | Creswick .. | 210 feet | .. .. | 11.10.1886 | Australasian Mining Co. .. | Nugget Book | |
| *280 | A | 138 18 0 | 138 18 0 | .. | Smythesdale .. | 30 feet | .. .. | 29.6.1911 | Boyd's Hydraulic Sluicing Co. | Nugget Book .. .. | A very solid waterworn nugget |
| 281 | A | 137 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 282 | Q | 137 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 494 feet | .. .. | .. | Woah Hawp Canton Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 283 | Q | 136 8 0 | .. | .. | Leviathan Reef, Maryborough | .. | .. .. | 20.5.1896 | Sharpe and Barry Amalgamated Mining Co. | *Maryborough Advertiser* Newspaper | A cluster of specimens |
| 284 | A | 136 0 0 | .. | .. | Jim Crow, Daylesford | 4 feet | .. .. | —.9.1858 | .. .. .. | W. Birkmyre, p. 368, R. B. Smyth's Gold-fields, &c. | |
| 285 | A | 136 0 0 | .. | .. | German Gully, Amherst | 4 feet | .. .. | —.9.1872 | .. .. .. | Mining Registrars' and Surveyors' Reports, September, 1872, p. 35 | |
| 286 | A | 136 0 0 | .. | 131 14 0 | Kitty's Lead, Buninyong | 9 feet | .. .. | 9.12.1870 | W. Kitt and P. Flood | R. M. Harvey, Mining Surveyor, Nugget Book | |
| 287 | A | 135 0 0 | .. | .. | Blackman's Lead, Maryborough | About 34 feet | .. .. | 1854 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 153 | In shape like a flattened pear |
| 288 | A | 132 9 0 | .. | 90 14 0 | Mt. Korong .. | 4½ feet | .. .. | —.10.1856 | .. .. .. | W. Birkmyre, p. 368 R. B. Smyth's Gold-fields, &c. | |
| 289 | A | 132 0 0 | .. | .. | No. 3 Gully, McIntyre's Ranges, Moliagul | 5 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 290 | Q | 132 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 260 feet | .. .. | .. | North Woah Hawp Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 291 | A | 131 10 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | W. Birkmyre, p. 374, R. B. Smyth's Gold-fields, &c. | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. | | | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross. | Net. | Estimated. | | | | | | | |
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 292 | A | 131 0 0 | .. | 127 10 0 | Humbug Gully, Chinaman's Flat, Timor | 40 feet | .. .. | 14.6.1878 | George Adlow and party | Progress Report No. VI., p. 35 | |
| *293 | A | 131 0 0 | 110 2 11 | .. | Caledonia Flat, Inglewood | 7 feet | .. .. | 6.12.1881 | J. Beattie and J. Hoase | Progress Report No. VII., p. 125 | Associated with quartz |
| 294 | A | 130 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | W. Birkmyre, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 295 | A | 130 0 0 | .. | .. | Kingower .. | 8 feet | .. .. | 4.11.1890 | Joseph Jenkins .. | Nugget Book | |
| 296 | A | 130 0 0 | .. | 106 0 0 | Whiskey Lead, Wombat, Daylesford | 14 feet | .. .. | 3.9.1875 | Tuohey and Jackson | Progress Report No. III., p. 119 | Associated with ironstone |
| 297 | A | 130 0 0 | .. | .. | Blue Gully, Blackwood | 5 feet | .. .. | 1896 | Atkins and Seymour | Nugget Book | |
| 298 | A | 130 0 0 | .. | 85 10 0 | Back Creek, Taradale | Surface | .. .. | 27.6.1879 | James Cadola .. | Nugget Book | |
| 299 | Q | 130 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. .. | —.11.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, November 28th, 1910 | On indicator |
| 300 | A | 128 10 0 | .. | .. | Great Extended Mine, Ballaarat | About 330 feet | .. .. | —.12.1862 | Great Extended Mining Co. | Dicker's Mining Record, December, 1862, p. 28 | |
| 301 | A | 128 2 12 | .. | 103 0 0 | No locality given .. | .. | .. .. | 1854 | .. .. .. | W. Birkmyre, p. 368 R. B. Smyth's Gold-fields, &c. | |
| 302 | A | 128 0 0 | .. | .. | Pennyweight Hill, Eureka, Ballaarat | Shallow | .. .. | —.3.1910 | .. .. .. | *Age* Newspaper, March 18th, 1910 | Found near the Canadian and Lady Barkly nuggets |
| 303 | A | 128 0 0 | .. | .. | Berlin, Kangderaar | .. | .. .. | —.3.1870 | .. .. .. | Dicker's Mining Record, March, 1870 | |
| *304 | A | 127 10 0 | .. | .. | Poseidon, Tarnagulla | 13 feet | "The Shellback" | 24.1.1907 | Cox and Newitt .. | A. M. Howitt, Records, Vol. III., Part 1. | Much quartz |
| 305 | A | 127 0 0 | .. | .. | Quakers' Gully, Dunolly | 10 feet | .. .. | 1854 | .. .. .. | F. Knox Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 306 | A | 126 10 0 | .. | 126 0 0 | Chinaman's Flat, Maryborough | About 120 feet | .. .. | 3.12.1872 | Henry Treloar .. | P. Virtue, jun., Mining Registrar, Nugget Book | Found on Magnum Bonum Co.'s mullock heap |
| 307 | A | 126 0 0 | .. | .. | Baker's Gully, Moliagul | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Dunolly Report | |
| 308 | A | 126 0 0 | .. | .. | Webbville, Buninyong | .. | .. .. | —.9.1869 | .. .. .. | Mining Registrars' and Surveyors' Reports, September, 1869, p. 26 | |
| 309 | A | 125 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 310 | Q | 125 0 0 | .. | .. | Nuggetty Gully Mine, Creswick | .. | .. .. | About 1895 | Nuggetty Gully Mining Co. | S. B. Hunter, Special Report | |
| 311 | A | 124 0 0 | .. | .. | New Nuggetty Gully, Yandoit | 15 feet | .. .. | 1899 | .. .. .. | Nugget Book | |
| 312 | Q | 124 0 0 | .. | .. | Wisbeach Hill, Korong | 26 feet | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377 R. B. Smyth's Gold-fields, &c. | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 313 | A | 123 0 0 | .. | .. | Nuggetty Gully, Dunolly | 3 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 314 | A | 122 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *315 | Q | 122 0 0 | .. | .. | East United Mine, Black Hill, Ballaarat | 400 feet | .. | .. | 15.2.1876 | East United Black Hill Mining Co. | Progress Report No. IV., p. 49 | |
| 316 | A | 121 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 317 | A | 120 14 0 | .. | .. | Break-of-Day, Rokewood | .. | .. | .. | —.8.1866 | .. .. .. | Dicker's Mining Record, August, 1866, p. 116 | |
| 318 | Q | 120 0 0 | .. | 99 0 0 | Butler's Reef, Heathcote | 1½ feet | .. | .. | 1874 | E. Hansen .. | E. Hansen, Nugget Book .. | Associated with some ironstone |
| 319 | A | 120 0 0 | 48 0 0 | .. | Old Lead, Tarnagulla | .. | .. | .. | —.11.1862 | .. .. .. | Dicker's Mining Record, November, 1862, p. 2 | |
| 320 | A | .. | .. | 120 0 0 | Brown's Gully, Middleton Creek, Glenlyon | 18 feet | .. | .. | 1859 | Scurry and party .. | Mark Amos, Mining Surveyor, Nugget Book | |
| 321 | A | 120 0 0 | .. | .. | Surface Gully, Moliagul | Surface | .. | .. | 1860 | .. .. .. | F. K. Orme, p 372 R. B. Smyth's Gold-fields, &c. | Found in red clay |
| 322 | Q | 120 0 0 | 80 0 0 | .. | Head of Welcome Gully, Parish of Franklin | 35 feet | .. | .. | 29.9.1894 | White and Jackson .. | W. Trenkner, Mining Registrar, Nugget File | On an indicator |
| 323 | A | 120 0 0 | .. | .. | On road between Allotments 12 and 21, John's Paddock, Kangderaar | 9 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 324 | A | 120 0 0 | .. | .. | Old Lead, Dunolly | 15 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 325 | A | 120 0 0 | .. | .. | Forest Creek, Parish of Chewton | Shallow | .. | .. | 1854 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 70 | Many nuggets over 10 lbs. in weight were found in Forest and Fryer's Creeks |
| 326 | A | 120 0 0 | .. | .. | Allotment No. 15, Berlin Flat, Kangderaar | 12 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 327 | A | 120 0 0 | .. | .. | Fryer's Creek, Parish of Fryers | Shallow | .. | .. | 1854 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 70 | |
| 328 | A | 120 0 0 | .. | .. | Old Lead, Dunolly | 12 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 329 | A | 120 0 0 | .. | .. | Tyler's Flat, Kangderaar | 12 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 330 | A | 120 0 0 | .. | .. | Kingower .. | Few inches | .. | .. | —.9.1858 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 331 | A | 120 0 0 | .. | .. | Caledonia Gully, Red Hill, Heathcote | Surface | .. | .. | —.12.1874 | Andrew Hansen .. | Mining Registrars' and Surveyors' Reports, December, 1874, p. 32 | |
| 332 | Q | 120 0 0 | .. | .. | Ballaarat .. | 160 feet | .. | .. | .. | Dalzell and Buchanan | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 333 | A | 120 0 0 | .. | .. | Milkmaid's Gully, Wattle Flat, Dunolly | 10 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 334 | A | 120 0 0 | .. | .. | Milkmaid's Gully, Wattle Flat, Dunolly | 10 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. | | | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross. | Net. | Estimated. | | | | | | | |
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 335 | A | 119 19 0 | .. | .. | John's Paddock, Berlin, Kangderaar | 9½ feet | .. .. | 23.12.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | The bottom was composed of rotten slate and granite |
| 336 | Q | 119 14 18 | .. | .. | Tarrengower .. | .. | .. .. | 1861 | .. .. .. | W. Birkmyre, p. 369, R. B. Smyth's Gold-fields, &c. | |
| 337 | A | 117 15 0 | .. | 116 5 0 | Tyler's Rush, Berlin, Kangderaar | 7 feet | .. .. | 15.9.1873 | C. Barrett and F. Maigret | Nesbitt Cockburn, Mining Registrar, Nugget Book | Flat and solid, with large void in the centre |
| 338 | A | 117 0 0 | 109 0 0 | .. | Perseverance Claim, Pitfield | 70 feet | .. .. | 17.2.1870 | Peter Scott and party | John Lynch, Mining Surveyor, Nugget Book | |
| 339 | A | 117 0 0 | .. | .. | Quaker's Gully, Dunolly | 10 feet | .. .. | 1859 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 340 | A | 116 10 0 | .. | .. | Break-of-Day Mine, Rokewood | 10 to 15 feet | .. .. | 2.10.1866 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 341 | A | 114 10 0 | .. | 109 0 0 | Berlin, Kangderaar | 5½ feet | .. .. | 23.3.1870 | Ah Hing and party .. | F. K. Orme, Warden, Nugget Book | |
| 342 | Q | 114 5 0 | .. | 100 0 0 | Black Hill Mine, Ballaarat | 320 feet | .. .. | 11.5.1874 | Black Hill Mining Co. | Progress Report No. II., p. 58 | |
| 343 | A | 114 0 0 | .. | .. | Break-of-Day Mine, Rokewood | 10 to 15 feet | .. .. | 11.8.1866 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 344 | A | 114 0 0 | .. | .. | Main Flat, Wedderburne | About 40 feet | .. .. | 1866 | Philip Archey .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| *345 | A | 114 0 0 | .. | 108 0 0 | Poseidon Lead, Tarnagulla | 68 feet | "The Maldon" | 8.8.1907 | Duschka and party .. | Nugget Book .. .. | Associated with cement |
| *346 | A | 113 12 0 | .. | .. | Killai's Creek, Wood's Point | 12 feet | .. .. | 23.5.1878 | Samuel Beardmore .. | Progress Report No. VI., p. 35 | The largest nugget found in the district to date |
| 347 | A | 113 0 0 | .. | .. | Red Streak Gully, Old Lead, Dunolly | About 50 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 348 | A | 113 0 0 | .. | .. | Near Black Reef, Moliagul | Surface | .. .. | 1.3.1869 | .. .. .. | J. Stirling, Progress Report No. III., p. 21 | Found close to the place where the "Welcome Stranger" nugget was unearthed |
| 349 | A | 112 0 0 | 112 0 0 | .. | Spring Hill, Creswick | 196 feet | .. .. | 2.4.1875 | Richardson's Western Freehold Mining Co. | James Stevenson, Mining Surveyor, Nugget Book | Solid gold |
| 350 | A | 112 0 0 | .. | 110 0 0 | Leviathan Mine, Ballaarat | 195 feet | .. .. | 25.4.1874 | Leviathan G. Mining Co. | Progress Report No. II., p. 58 | |
| 351 | A | 112 0 0 | .. | .. | Berlin Flat, Kangderaar | .. | .. .. | Prior to 21.12.1868 | .. .. .. | F. K. Orme, p. 375 R. B. Smyth's Gold-fields, &c. | |
| 352 | A | 112 0 0 | .. | .. | Sons of Freedom Mine, Durham Lead, Ballaarat | About 300 feet | .. .. | —.2.1866 | .. .. .. | Dicker's Mining Record, February, 1866, p. 104 | |
| 353 | A | 112 0 0 | .. | .. | 1½ Miles S.W. of Marong Township, Bendigo | 167 feet | .. .. | 21.5.1903 | Captain Thomas and party | H. S. Whitelaw | |
| *354 | A | 111 19 0 | .. | .. | Little Wonder Claim, Taradale | 140 feet | .. .. | 3.4.1880 | Little Wonder Mining Co. | J. Dorman, Nugget Book | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 355 | A | 110 15 0 | .. | .. | Cosmopolitan Mine, Ballaarat | About 400 feet | .. | .. | —.1.1864 | Cosmopolitan Mining Co. | Dicker's Mining Record, January, 1864, p. 9 | |
| 356 | A | 110 9 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| *357 | A | 109 6 0 | .. | 109 6 0 | Rheola, Berlin, Kangderaar | 9 feet | .. | .. | 9.2.1882 | .. .. .. | Nugget Book .. .. | All gold |
| 358 | A | 109 0 0 | .. | 107 12 0 | Berlin, Kangderaar | 9 feet | .. | .. | 12.1.1870 to 24.3.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 359 | A | 108 14 0 | .. | .. | Break-of-Day Mine, Rokewood | 10 to 15 feet | .. | .. | 20.11.1866 | Break-of-Day Mining Co. | J. Coleman, Mining Registrar, Nugget Book | |
| 360 | A | 108 12 0 | 108 12 0 | .. | Berlin, Kangderaar | 2 feet | .. | .. | 20.8.1870 | Ah Son and party .. | F. K. Orme, Warden, Nugget Book | Found in red clay. All gold |
| 361 | A | 108 0 0 | 84 0 0 | .. | Havelock, Parish of Maryborough | 3 feet | .. | .. | 18.10.1878 | Michael Fitzharris and party | P. Virtue, Mining Registrar, Nugget Book | Associated with quartz |
| 362 | A | 108 0 0 | .. | .. | Ashe's Lead, Ballaarat East | 10 feet | .. | .. | 1874 | .. .. .. | W. Baragwanath, jun. | |
| 363 | A | 108 0 0 | .. | .. | Peg Leg Gully, Eaglehawk | Shallow | .. | .. | 1851 or 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 73 | |
| 364 | A | 108 0 0 | .. | .. | Milkmaid's Gully, Dunolly | 10 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 365 | A | 108 0 0 | .. | .. | Clodhopper Gully, near Moliagul Township | Shallow | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 366 | A | 108 0 0 | .. | 106 10 0 | Koh-i-noor Mine, Ballaarat | 250 feet | .. | .. | 26.5.1869 | Koh-i-noor Mining Co. | H. Wood, Mining Registrar, Nugget Book | Found below 2 strata of basalt |
| 367 | A | 107 12 0 | .. | 105 12 0 | Berlin, Kangderaar | 5 feet | .. | .. | 29.7.1870 | .. .. .. | H. J. Hughes, Mining Registrar, Nugget Book | In shape like a twist loaf |
| 368 | A | 107 5 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| *369 | A | 107 4 0 | .. | 77 6 7 | Lothair Mine, Clunes | 307 feet | "The Lothair" .. | | 11.7.1875 | Lothair Mining Co. .. | Nugget Book | |
| 370 | Q | 107 0 0 | .. | .. | Prince of Wales Mine, Ballaarat | 400 feet | .. | .. | 1910 | .. .. .. | W. Baragwanath, jun. | |
| 371 | A | 106 15 0 | .. | .. | Kingower .. | Shallow | .. | .. | —.9.1861 | .. .. .. | W. Birkmyre, p. 369 R. Brough Smyth's Gold-fields, &c. | |
| 372 | A | 106 10 0 | .. | .. | Vaughan, Castlemaine | 3 feet | .. | .. | —.7.1867 | Richard Dunstan .. | Dicker's Mining Record, July, 1867, p. 36 | |
| 373 | A | 106 10 0 | 90 0 0 | .. | Keep-it-Dark Gully, Hepburn | 10 feet | .. | .. | 9.10.1869 | J. W. Walker and G. Lawson | T. Hale, Mining Registrar, Nugget Book | Nearly all gold |
| 374 | A | 106 0 0 | .. | .. | Gilmore's Gully, Langham Flat, Kangderaar | 9 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 375 | A | 106 0 0 | 106 0 0 | .. | Blanket Flat, Hepburn | Shallow | .. | .. | - .9.1875 | .. .. .. | T. Hale, Mining Registrar, Mining Surveyors' Reports, September 1875, p. 32 | Pure gold |
| 376 | A | 106 0 0 | .. | .. | Waanyarra Rush .. | 26 feet | .. | .. | 22.6.1903 | Taig, Rymer, and Storer | Nugget Book .. .. | 2 feet above the bedrock |
| 377 | A | 106 0 0 | .. | .. | Dunolly District .. | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 378 | A | 106 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. | .. | —.6.1907 | Jackson and Hughes | Nugget Book | |
| 379 | Q | 106 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 441 feet | .. | .. | .. | Woah Hawp Canton Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 380 | A | 105 0 0 | .. | .. | Old Lead, Dunolly District | 40 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| *381 | A | 105 0 0 | .. | .. | Irishman's Claim, Nick-of-Time Lead, Tarnagulla | 50 feet | .. .. | 21.11.1904 | Hayes, Firth, and party | A. M. Howitt, Records, Vol. III., Part I. | |
| 382 | A | 105 0 0 | 61 13 0 | .. | Poseidon Lead, Tarnagulla | 68 feet | "The Baby" .. | 23.9.1907 | Hockey and Roach .. | Nugget Book | |
| 383 | A | 104 10 0 | 75 0 0 | .. | Poseidon Lead, Tarnagulla | 13 feet | "New Year's Gift" | 8.1.1907 | Mackenzie and party | A. M. Howitt, Records, Vol. III., Part I. | Nearly on bedrock |
| 384 | A | 104 8 0 | .. | .. | Mount Moliagul .. | Shallow | .. .. | —.11.1857 | .. .. .. | W. Birkmyre, p. 369 R. Brough Smyth's, &c. | Solid lump of gold |
| 385 | A | 104 0 0 | .. | .. | Godfrey's Creek, Alexandra | .. | .. .. | —.1.1869 | .. .. .. | Dicker's Mining Records, January, 1869 | |
| 386 | Q | 104 0 0 | .. | 60 0 0 | Woah Hawp Canton Mine, Ballaarat | 840 feet | .. .. | —.10.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, October 6th, 1909 | On indicator |
| 387 | A | 104 0 0 | .. | .. | Wilson's Lead, Dunolly District | 15 feet | .. .. | 1863 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 388 | A | 104 0 0 | .. | 84 0 0 | Hit or Miss, Vaughan, Parish of Fryers | 4 feet | .. .. | —.6.1867 | Richard and Benjamin Dunstan | Mark Amos, Mining Surveyor, Nugget Book | Flat nugget |
| 389 | A | 103 10 0 | 100 10 0 | .. | Cobbler's Gully, Caledonia, Warrandyte | 6 feet | .. .. | 28.12.1874 | James Goodson .. | Progress Report No. III., p. 118 | |
| 390 | A | 103 0 0 | 103 0 0 | .. | Berlin Diggings, Kangderaar | 20 inches | .. .. | 12.8.1870 | P. Lorimer and party | F. K. Orme, Warden, Nugget Book | Solid gold |
| 391 | A | 103 0 0 | .. | 101 0 0 | Near John's Paddock, Berlin, Kangderaar | Surface | "The Doncaster" | 15.7.1872 | Isaac Doncaster .. | H. J. Hughes, Mining Registrar, Nugget Book | Flat nugget |
| 392 | Q | 102 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 600 feet | .. .. | .. | Woah Hawp Canton Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 393 | A | 102 0 0 | .. | .. | Paddy's Gully, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 394 | A | 101 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. .. | —.3.1869 | .. .. .. | Dicker's Mining Record, March, 1869 | In two pieces |
| *395 | A | 101 0 0 | 101 0 0 | .. | Working Miners, Homebush | 165 feet | "The Homebush" | 21.7.1881 | .. .. .. | Progress Report No. VII., p. 126 | All gold |
| 396 | A | 100 10 0 | .. | .. | Kingower Diggings | .. | .. .. | —.11.1857 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 397 | A | 100 0 0 | .. | .. | Baker's Gully, near Moliagul Township | 10 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 398 | A | 100 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 399 | A | 100 0 0 | .. | .. | Wattle Flat, Dunolly | 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400 | A | 100 0 0 | .. | .. | Wattle Flat, Dunolly | 20 feet | .. | .. | .. | .. | W. H. Ferguson | | |
| 401 | A | 100 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 80 feet | .. | .. | —.2.1910 | Dividend Syndicate .. | Nugget Book | | |
| 402 | Q | 100 0 0 | .. | .. | Redbank, head of Walking Stick Gully | 15 feet | .. | .. | 19.12.1902 | W. Luscombe .. | Nugget Book .. .. | From an indicator | |
| 403 | A | 100 0 0 | .. | .. | Berlin Flat, Kangderaar | 12 feet | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | | |
| 404 | A | 100 0 0 | .. | .. | Broadman's Flat, Dunolly | About 20 feet | .. | .. | .. | .. | W. H. Ferguson | | |
| 405 | A | 100 0 0 | .. | .. | Wattle Flat, Dunolly | 20 feet | .. | .. | .. | .. | W. H. Ferguson | | |
| 406 | A | 100 0 0 | .. | .. | Kangaroo Flat, Bendigo | .. | .. | .. | - .10.1867 | .. | Dicker's Mining Record, October, 1867, p. 165 | | |
| 407 | A | 100 0 0 | .. | .. | Nuggetty Gully, Fryerstown | 4 feet | .. | .. | 1856 | Daniel Fitz .. | Mark Amos, Mining Surveyor, Nugget Book | Close to several others | |
| 408 | Q | 100 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | Between 753 and 930 feet | .. | .. | 1910–1911 | Woah Hawp Canton Mining Co. | W. Baragwanath, jun. .. | On indicator | |
| 409 | Q | 100 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | Between 753 and 930 feet | .. | .. | 1910–1911 | Woah Hawp Canton Mining Co. | W. Baragwanath, jun. .. | On indicator | |
| 410 | Q | 100 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | Between 753 and 930 feet | .. | .. | 1910–1911 | Woah Hawp Canton Mining Co. | W. Baragwanath, jun. .. | On indicator | |
| 411 | Q | 100 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 to 945 feet | .. | .. | 1910–1911 | North Woah Hawp Mining Co. | W. Baragwanath, jun. .. | On indicator | |
| 412 | Q | 100 0 0 | .. | .. | Llanberris Mine, Ballaarat | 453 feet | .. | .. | .. | Llanberris Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator | |
| 413 | Q | 99 10 17 | .. | 28 6 0 | Tarrengower .. | .. | .. | .. | 1861 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | | |
| 414 | A | 99 2 0 | 93 0 0 | .. | Jones' Creek, Waanyarra | Shallow | .. | .. | —.12.1888 | .. .. .. | Mining Registrars' Reports, December, 1888, p. 24 | With ironstone and quartz | |
| *415 | A | 99 0 0 | 97 0 0 | .. | Shicer Gully, Wedderburne | 13 feet | .. | .. | 9.8.1880 | Philip Archer .. | Progress Report No. VII., p. 125 | | |
| 416 | A | 98 7 0 | 69 12 0 | .. | Cosmopolitan Mine, Ballaarat | About 400 feet | .. .. | .. .. | —.6.1863 | .. .. .. | Dicker's Mining Records, June, 1863, p. 147 | Associated with quartz | |
| 417 | A | 98 0 0 | .. | 88 11 0 | Campbell's Hill, Smythesdale | .. | .. | .. | 9.8.1871 | Party of Chinese .. | J. Lynch, Mining Surveyor, Nugget Book | | |
| 418 | A | 96 0 0 | .. | .. | Steel's Gully, Wedderburne | 12 feet | .. | .. | 1854 | James Rogerson .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | | |
| 419 | A | 96 0 0 | .. | .. | Potter's Hill, Wedderburne | Shallow | .. | .. | 1853 | James Bangery .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | | |
| 420 | A | 96 0 0 | .. | .. | Bocca Flat, Wedderburne | Shallow | .. | .. | 3.2.1869 | .. .. .. | Nugget Book | | |
| 421 | A | 96 0 0 | .. | .. | Wisbeach Rush (Allot. 8, Sec. 1, Kingower) | 40 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 22 | | |
| 422 | A | 96 0 0 | 76 11 0 | .. | Gipsy Rush, Dunolly | 20 feet | .. | .. | —.12.1868 | Levi and party .. | Dicker's Mining Record, December, 1868, p. 152 | | |
| 423 | A | 96 0 0 | .. | .. | Mosquito Gully, near Spring Hill, Creswick | .. | .. | .. | —.6.1874 | .. .. .. | Mining Registrars' and Surveyors' Reports, June, 1874, p. 26 | | |
| 424 | A | 96 0 0 | .. | .. | Langham Flat, Berlin, Kangderaar | 9 feet | .. | .. | —.12.1874 | .. .. .. | Mining Registrars' and Surveyors' Reports, December, 1874, p. 34 | Solid gold on granite bottom | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 425 | A | 96 0 0 | .. | .. | Strathalbyn, a tributary of Armenian Gully, between Redbank and Stuart Mill | Shallow | .. .. | —.12.1870 | .. .. .. | Mining Registrars' and Surveyors' Reports, December, 1870, p. 35 | |
| 426 | A | 96 0 0 | .. | .. | Unabolished Mine, Break - of - Day, Rokewood | .. | .. .. | —.12.1865 | .. .. .. | Dicker's Mining Record, December, 1865, p. 389 | |
| 427 | A | 96 0 0 | .. | 94 11 6 | John's Paddock, Berlin, Kangderaar | 3 feet | .. .. | 23.4.1873 | Archie Gray .. | J. Martin, Mining Registrar, Nugget Book | |
| 428 | A | 96 0 0 | .. | 57 12 12 | Hit or Miss Gully, Fryers | 20 feet | .. .. | 29.7.1869 | Henry Dunstan .. | Mark Amos, Mining Surveyor, Nugget Book | Nearly round |
| 429 | A | 95 6 0 | .. | .. | Jim Crow Creek, Daylesford | Shallow | .. .. | 1855 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 430 | A | 95 0 0 | .. | .. | Turkey, Flat, Dunolly | 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 431 | A | 94 7 0 | .. | 90 19 21 | Break - of - Day, Rokewood | 12 feet | .. .. | —.6.1871 | Break o' Day Mining Co. | J. F. Coleman, Mining Registrars' and Surveyors' Reports, June, 1871, p. 23 | Associated with ironstone |
| 432 | A | 94 0 0 | .. | .. | Nuggetty Gully, Fryerstown | 4 feet | .. .. | 1856 | John Burke .. | Mark Amos, Mining Surveyor, Nugget Book | |
| 433 | A | 93 17 6 | .. | 84 9 12 | Mosquito Gully, near Spring Hill, Creswick | 15 feet | .. .. | 18.9.1874 | Ah Fee and party .. | Progress Report No. II., p. 58 | |
| 434 | A | 93 17 0 | .. | 92 14 9 | Tyler's Diggings, Berlin, Kangderaar | 11 feet | .. .. | 26.9.1873 | T. W. Hodgson and G. Torrance | R. A. Williams, Bank of N.S.W., Berlin, Nugget Book | A square nugget |
| *435 | A | 93 14 0 | 93 8 18 | .. | Garden Flat, Majorca, Craigie | 18 feet | .. .. | 24.7.1879 | Rowe and Mulligan .. | Progress Report No. VII., p. 125 | Solid gold |
| 436 | A | 92 0 0 | .. | .. | Nuggetty Hill, Dunolly District | 16 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| *437 | A | 92 0 0 | .. | 90 0 0 | Dunolly .. .. | 15 feet | .. .. | 26.7.1881 | Peter Miller and party | Progress Report, No. VII., p. 126 | Waterworn, flat, and triangular |
| 438 | A | 92 0 0 | .. | 84 8 0 | New Nuggetty Gully, near Yandoit | 14 feet | .. .. | 23.6.1882 | Brenton and party .. | James Stevenson, Mining Registrar, Nugget Book | |
| 439 | A | 92 0 0 | .. | 87 14 0 | Kitty's Lead, Buninyong | 9 inches | .. .. | 16.12.1870 | Sutherland and party | Nugget Book .. .. | In red clay |
| 440 | A | 91 17 0 | 80 14 0 | .. | Poseidon Lead, Tarnagulla | 4 feet | .. .. | 13.7.1907 | Jackson and Hughes | A. M. Howitt | |
| 441 | A | 91 0 0 | .. | .. | Gilmore's Gully, Langham Flat | 9 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 442 | A | 90 0 0 | .. | 87 10 12 | Tyler's Rush, Berlin, Kangderaar | 10 feet | .. .. | 24.3.1870 | Whittington and party | F. K. Orme, Nugget Book .. | Flat nugget |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 443 | Q | 90 0 0 | .. | .. | New Normanby Mine, Ballaarat | 805 feet | .. .. | .. | New Normanby Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 444 | Q | 90 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. .. | —.8.1910 | North Woah Hawp Mining Co. | *Age* newspaper, August 11th, 1910 | On indicator |
| 445 | Q | 90 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. .. | —.7.1909 | Woah Hawp Canton Mining Co. | *Age* newspaper, July 12th, 1909 | On indicator |
| 446 | A | 90 0 0 | .. | .. | Kingower .. | 2 feet | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377, R. B. Smyth's Gold-fields, &c. | |
| 447 | A | 90 0 0 | .. | .. | Black Hill, Ballaarat | .. | .. .. | 14.10.1851 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | A solid mass of gold |
| 448 | A | 90 0 0 | .. | 80 0 0 | In Baker's Orchard, Jones' Creek, Waanyarra | 20 feet | .. .. | 22.4.1901 | Haywood and party | Nugget Book .. .. | Close to an indicator line |
| 449 | A | 90 0 0 | .. | .. | Nuggetty Gully, Dunolly District | 4 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 450 | A | 90 0 0 | .. | .. | Lady Don Mine, Ballaarat | .. | .. .. | —.3.1867 | Lady Don Mining Co. | Dicker's Mining Record, March, 1867, p. 165 | Taken from a machine of washdirt |
| 451 | A | 90 0 0 | .. | 66 10 0 | Jericho, Jordan River, Woods Point | 15 feet | .. .. | 28.3.1867 | Grogan and party .. | A. B. Ainsworth, Mining Surveyor, Nugget Book | 3 inches above the bedrock |
| 452 | A | 89 6 0 | 89 0 0 | .. | Berlin Diggings, Kangderaar | Shallow | .. .. | —.11.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | Pure gold |
| *453 | A | 88 0 0 | 80 0 0 | .. | Poseidon Lead, Tarnagulla | 9 feet | "The Gem" .. | 29.11.1906 | Wragge Bros. .. | A. M. Howitt, Records, Vol. III., Part I. | Found on the bedrock |
| 454 | A | 88 0 0 | .. | 85 10 0 | Hard Hill, Talbot | 6 feet | | 1.11.1865 | Thos. Thomas and Jas. Moore | Joseph Smith, Mining Surveyor, Nugget Book | |
| 455 | A | 87 0 0 | .. | .. | Dunolly District .. | .. | .. .. | About 21.10.1868 | .. .. .. | Mining Surveyors' Reports, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 456 | A | 87 0 0 | .. | .. | Prospectors' Claim, Stockyard Creek, Foster | 20 feet | .. .. | 3.6.1876 | Found by tributers .. | C. R. Murphy, Mining Registrar, Nugget Book | Found 160 yards from the No. 1 South Prospectors' Claim |
| *457 | A | 87 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 3 feet | "The Outsider" | 2.2.1907 | Hannan and Gascoyne | A. M. Howitt, Records, Vol. III., Part I. | 15 inches above the bedrock |
| 458 | A | 87 0 0 | .. | .. | Near Jericho Township, Jordan River | .. | .. .. | —.7.1866 | .. .. .. | Dicker's Mining Records, July, 1866, p. 55 | |
| 459 | A | 87 0 0 | .. | .. | Near Township of Moonambel, Warrenmang | Shallow | .. .. | .. | .. .. .. | A. M. Howitt | |
| *460 | A | 86 18 12 | .. | 86 0 0 | Old Dunolly, ½ mile south of Bealiba Reef | 7 feet | .. .. | 14.9.1881 | William Rogers .. | Nugget Book .. .. | Like a clinker, filled with holes |
| *461 | A | 86 16 21 | .. | .. | Garden Gully, Stawell, 1½ miles from Township of Great Western | Surface | .. .. | 15.10.1887 | .. .. .. | Nugget Book | |
| 462 | A | 86 16 0 | .. | .. | Break-of-Day Mine, Rokewood | 10 to 15 feet | .. .. | 12.9.1866 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| *463 | A | 86 10 0 | .. | .. | Poseidon Lead, Tarnagulla | 15 inches | "The Georgina" | 4.1.1907 | Smith, Stephenson, and Rogers | A. M. Howitt, Records, Vol. III., Part I | A few inches above the bedrock |
| 464 | A | 86 0 0 | 86 0 0 | .. | Berlin Diggings, Kangderaar | 15 inches | .. .. | 11.8.1870 | Ah Son and party .. | F. K. Orme, Warden, Nugget Book | All gold |
| 465 | A | 86 0 0 | .. | 65 0 0 | Specimen Creek, Big River | .. | .. .. | —.6.1871 | Thomas Davis .. | A. B. Ainsworth, Mining Surveyor, Nugget Book | Associated with ironstone and quartz |
| 466 | A | 86 0 0 | .. | .. | Stirling Rush, West of Wedderburne | .. | .. .. | .. | .. .. .. | From Geological Rapid Survey Plan | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Net. | Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 467 | A | 85 0 0 | 54 0 0 | .. | Back Creek, Simmons' Reef, Blackwood | 20 feet | .. .. | —.3.1882 | .. .. .. | Mining Registrars' and Surveyors' Reports, March, 1882, p. 26 | |
| 468 | A | 84 16 0 | .. | 71 3 12 | Kitty's Lead, Buninyong | 1 foot | .. .. | 26.10.1870 | .. .. .. | Nugget Book | |
| *469 | A | 84 4 0 | .. | .. | Inglewood .. | 7 feet | .. .. | 30.1.1890 | Joseph Jenkins .. | Nugget Book | |
| 470 | A | 84 0 0 | .. | .. | Inkerman Lead, Dunolly | Shallow | .. .. | 1855 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 471 | A | 84 0 0 | .. | .. | Nuggetty Gully, Dunolly | 6 feet | .. .. | 1857 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | Found in gravelly clay |
| 472 | A | 84 0 0 | 84 0 0 | .. | Berlin Flat, Kangderaar | 10 inches | .. .. | 6.8.1870 | Samuel Segrave and party | F. K. Orme, Mining Registrar, Nugget Book | All gold |
| 473 | A | 84 0 0 | 78 0 0 | .. | Happy Valley, Queenstown | Shallow | .. .. | .. | .. .. .. | F. K. Orme, p. 378 R. B. Smyth's Gold-fields, &c. | |
| 474 | A | 84 0 0 | .. | .. | Nuggetty Gully, Dunolly | 3 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 475 | A | 84 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 476 | A | 84 0 0 | .. | .. | Pick and Shovel Flat, Korong | 5 feet | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377. R. B. Smyth's Gold-fields, &c. | |
| 477 | A | 84 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 71 feet | .. .. | —.9.1908 | Last Chance Mining Co. | *Age* Newspaper, 21st September, 1908 | |
| 478 | A | 84 0 0 | .. | .. | Mt. Greenock, Amherst | Deep | .. .. | —.3.1871 | Hoffnung Mining Co. | Mining Registrars' and Surveyors' Reports, March, 1871, p. 31 | In three nuggets. Below basalt |
| 479 | A | 84 0 0 | .. | .. | Potter's Hill, Wedderburne | 2 feet | .. .. | .. | Reach's party .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | |
| 480 | A | 83 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 481 | A | 83 0 0 | .. | 83 0 0 | Break-of-Day Mine, Rokewood | 12 feet | .. .. | 3.7.1869 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | Found three feet above bottom |
| 482 | A | 82 0 0 | .. | 60 0 0 | Prospector's Claim, Foster | 26 feet | .. .. | 2.10.1872 | .. .. .. | E. W. Turner, Mining Registrar, Nugget Book | |
| 483 | A | 82 0 0 | .. | .. | Judy Point, Wedderburne | Shallow | .. .. | 1859 | John Horton and party | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 484 | A | 82 0 0 | .. | .. | Near Black Jack's Gully, Wedderburne | Shallow | .. .. | .. | .. .. .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 485 | A | 82 0 0 | .. | 48 2 0 | Specimen Gully, Jones' Creek, Waanyarra | 14 feet | .. .. | 7.1.1875 | Joseph Tyson and party | Progress Report No. III., p. 118 | |
| 486 | A | 82 0 0 | 56 0 0 | .. | Old Lead, Dunolly | 20 to 60 feet | .. .. | —.3.1868 | .. .. .. | Dicker's Mining Record, March, 1868, p. 95 | |
| 487 | A | 81 3 0 | .. | 15 0 0 | Stockyard Creek, Foster | 47 feet | .. .. | 13.10.1873 | Prospectors' Claim .. | G. S. Coulson, Mining Registrar, Nugget Book | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 488 | Q | 81 1 0 | .. | 59 0 0 | White Horse Reef, Amherst | 46 feet | .. | .. | About —.4.1877 | White Horse Mining Co. | Progress Report No. V., p. 43 .. | In shape like a tortoise |
| 489 | A | 81 0 0 | 78 12 0 | .. | Poseidon Lead, Tarnagulla | 64 feet | .. | .. | 14.9.1908 | Hickey and Ellerton | A. M. Howitt | |
| 490 | A | 81 0 0 | .. | .. | Berlin Rush, Kangderaar | 8 feet | .. | .. | —.11.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 491 | Q | 80 0 0 | .. | .. | New Speedwell Mine, Ballaarat | 390 feet | .. | .. | .. | .. .. .. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 492 | A | 80 0 0 | .. | .. | Catto's Paddock, Berlin, Kangderaar | 12 feet | .. | .. | —.9.1869 | Party of Chinese .. | Dicker's Mining Record, September, 1869 | |
| 493 | A | 80 0 0 | .. | .. | Union No. 1 South Mine, Stockyard Creek, Foster | .. | .. | .. | —.12.1871 | Union No. 1 South Mining Co. | Mining Registrars' and Surveyors' Reports, December, 1871, p. 32 | A specimen |
| 494 | A | 80 0 0 | 67 0 0 | .. | Poseidon Lead, Tarnagulla | 4 feet | .. | .. | 13.4.1907 | Jackson and Hughes | A. M. Howitt | |
| 495 | A | 80 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | —.10.1865 | .. .. .. | Dicker's Mining Record, October, 1865, p. 251 | |
| 496 | A | 80 0 0 | 80 0 0 | .. | Berlin Flat, Kangderaar | 10 inches | .. | .. | 5.8.1870 | Peter Lorimer and party | F. K. Orme, Mining Registrar, Nugget Book | All gold |
| 497 | A | 80 0 0 | .. | .. | Back Creek Diggings, Talbot, Amherst | About 35 feet | .. | .. | —.3.1859 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 199 | |
| 498 | Q | 80 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.6.1909 | Woah Hawp Canton Mining Co. | The *Age* Newspaper, 30th June, 1909 | On indicator; 696 ounces of specimens for fortnight |
| 499 | A | 80 0 0 | .. | .. | McIntyre's Claim, Tarnagulla | .. | .. | .. | 17.11.1906 | McIntyre's Mining Co. | Nugget Book | |
| *500 | A | 80 0 0 | .. | .. | Working Miners' Claim, Homebush | 170 feet | .. | .. | 24.3.1880 | Working Miners' Mining Co. | Progress Report No. VI., p. 35 | |
| 501 | Q | 80 0 0 | 60 0 0 | .. | Woah Hawp Canton Mine, Ballaarat | 950 feet | .. | .. | —.11.1910 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 11th November, 1910 | On indicator |
| 502 | Q | 80 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.9.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 28th September, 1909 | On indicator |
| 503 | Q | 80 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.11.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 26th November, 1910 | On indicator |
| 504 | A | 80 0 0 | .. | .. | Wattle Flat, Dunolly | Shallow | .. | .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 505 | A | 79 5 0 | 79 5 0 | .. | Tyler's Rush, Kangderaar | 11 feet | .. | .. | 13.4.1870 | William Aldus and party | T. Richardson, Mining Registrar, Nugget Book | Flat nugget, all gold |
| 506 | Q | 79 0 0 | .. | .. | Spring Gully Mine, Castlemaine | .. | .. | .. | 30.11.1904 | A party of Tributers .. | Nugget Book .. .. | In quartz reef |
| 507 | A | 78 19 0 | .. | .. | Mount Blackwood, Parish of Blackwood | .. | .. | .. | 1851 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 508 | A | 78 10 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 509 | A | 78 0 0 | .. | .. | Gooseberry Flat, Dunolly | 40 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 510 | A | 78 0 0 | .. | .. | Berlin Flat, Kangderaar | 12 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 511 | A | 77 0 0 | .. | .. | Welshman's Point, Wedderburne | .. | .. | .. | 1854 | Firth and party .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 512 | A | 77 0 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | Shallow | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377, R. B. Smyth's Gold-fields, &c. | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 513 | A | 76 10 0 | .. | .. | Berlin Rush, Kangderaar | 12 feet | .. .. | 9.6.1869 | Young and party .. | R. Mason, Mining Registrar. Nugget Book | |
| 514 | Q | 76 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 500 feet | .. .. | .. | North Woah Hawp Mining Co. | J. W. Gregory. Memoir No. IV., p. 8 | On indicator |
| 515 | A | 76 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 516 | A | 76 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 517 | A | 76 0 0 | .. | .. | Canadian Gully, Ballaarat | 60 feet | .. .. | 31.1.1853 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| *518 | A | 75 12 0 | .. | 74 15 0 | Golden Age Co-operative Mine, Browns, Scarsdale | 150 feet | .. .. | 8.4.1880 | Golden Age Mining Co. | Progress Report No. VII., p. 125 | |
| 519 | A | 75 10 0 | .. | .. | Merrijig Creek, Gippsland | .. | "The Argus" .. | 11.9.1895 | .. .. .. | Nugget Book | |
| *520 | A | 75 5 0 | 73 4 6 | .. | Elysian Flat, Bendigo | 45 feet | .. .. | 28.12.1877 | James Webster .. | Progress Report No. VI., p. 35 .. | Found in cement |
| *521 | A | 75 5 0 | .. | 75 0 0 | Madam Berry Mine, Creswick | 475 feet | "The Ear" .. | 31.1.1882 | Madam Berry Mining Co. | Progress Report No. VII., p. 126 | In the shape of an ear |
| 522 | A | 75 0 0 | .. | .. | St. John's Patch, McIntyre's, Moliagul | Shallow | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 523 | A | 75 0 0 | .. | .. | Green Gully, about 8 miles south of Fryerstown, Holcombe | 30 feet | .. .. | —.3.1870 | .. .. .. | Mining Registrars' and Surveyors' Reports, March, 1870, p. 32 | |
| 524 | A | 75 0 0 | .. | .. | Bocca Flat, Wedderburne | Shallow | .. .. | 1862 | H. Presnell and party | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 525 | A | 75 0 0 | .. | .. | Milkmaid's Gully, Dunolly | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 526 | A | 75 0 0 | .. | 72 0 0 | Green Gully, 8 miles south of Fryerstown, Holcombe | 30 feet | .. .. | 21.3.1870 | William Lilford .. | Mark Amos, Mining Surveyor. Nugget Book | |
| 527 | Q | 75 0 0 | .. | .. | Berlin Reef, Maryborough | .. | .. .. | .. | .. .. .. | A. M. Howitt, Memoir No. XI. .. | Flat nugget, appears to be on an indicator line |
| 528 | A | 75 0 0 | .. | 71 0 0 | Break-of-Day, Rokewood | 3 feet | .. .. | 20.9.1872 | Elders Estate Co.'s Claim | J. F. Coleman, Mining Registrar, Nugget Book | |
| 529 | A | 75 0 0 | .. | 74 12 0 | Tyler's Rush, Kangderaar | 6 feet | .. .. | 22.2.1870 | G. Crowe and party .. | F. Knox Orme, Warden, Nugget Book | A flat nugget |
| 530 | A | 74 0 0 | .. | .. | Gooseberry Hill, Dunolly | 50 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |
| 531 | A | 73 0 0 | .. | .. | Ironbark Gully, Wedderburne | Shallow | .. .. | 1857 | Mr. Jessup .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 532 | A | 73 | 0 | 0 | .. | .. | Old Lead, Dunolly | .. | .. | .. | —.6.1872 | .. | Mining Registrars' and Surveyors' Reports, June, 1872, p. 36 | |
| 533 | A | 73 | 0 | 0 | .. | .. | Nuggetty Gully, Dunolly | 3 feet | .. | .. | 1866 | .. | F. K. Orme, Warden, R. Brough Smyth's Gold-fields, &c., p. 372 | |
| *534 | A | .. | | | .. | 72 14 10 | Rokewood .. | .. | .. | .. | 24.11.1904 | .. | Nugget Book .. | Associated with quartz |
| 535 | A | 72 | 10 | 0 | .. | 71 11 12 | Kingower .. | 6 inches | .. | .. | 21.11.1887 | Michael Crowley .. | Nugget Book .. | In shape like a hand |
| 536 | A | 72 | 0 | 0 | .. | 70 0 0 | Green Gully, about 8 miles south of Fryerstown, Holcombe | 27 feet | .. | .. | —.1.1870 | William Lilford .. | Mark Amos, Mining Surveyor, Nugget Book | Found 3 feet above bedrock |
| 537 | A | 72 | 0 | 0 | .. | .. | Bocca Flat, Wedderburne | 8 feet | .. | .. | .. | .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 538 | A | 72 | 0 | 0 | .. | .. | Snow's Gully, Wedderburne | .. | .. | .. | 1857 | James Lubbock .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 539 | A | 72 | 0 | 0 | .. | .. | Bloomfield Gully, Creswick | About 80 feet | .. | .. | —.6.1872 | L. R. Carter and party | James Stevenson, Mining Registrar, Report, June, 1872 | |
| *540 | A | 72 | 0 | 0 | .. | 71 10 0 | New Nuggetty Gully, Yandoit | 15 feet | "The Yandoit" | | 31.12.1880 | G. Vinecombe and party | Progress Report No. VII., p. 125 | |
| 541 | Q | 72 | 0 | 0 | .. | 50 0 0 | No. 1 S. Amalgamated Mine, Foster | 40 feet | .. | .. | 14.12.1875 | Party of quartz miners | Progress Report No. IV., p. 49 .. | On quartz vein and associated with pyrites |
| 542 | A | 72 | 0 | 0 | 64 14 0 | .. | Hard Hills, Berlin | 33 feet | .. | .. | 12.5.1875 | Thomas Warden and Robert Baird | Progress Report No. III., p. 119 | On a granite bedrock and associated with a small quantity of quartz |
| 543 | A | 72 | 0 | 0 | .. | .. | Poseidon Lead, Tarnagulla | 78 feet | .. | .. | 20.7.1910 | Dividend Syndicate .. | A. M. Howitt | |
| 544 | A | 72 | 0 | 0 | .. | .. | Wattle Flat, Campbell's Creek, parish of Castlemaine | Shallow | .. | .. | —.2.1853 | .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 57 | |
| 545 | A | 72 | 0 | 0 | .. | .. | Reserve, Rheola, Kangderaar | 12 feet | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 546 | A | 72 | 0 | 0 | .. | .. | Berlin Flat, Kangderaar | 12 feet | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 547 | A | 72 | 0 | 0 | .. | .. | Tyler's Flat, Kangderaar | 12 feet | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 548 | A | 72 | 0 | 0 | .. | .. | Gilmore's Gully, Langham Flat, Kangderaar | 9 feet | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 549 | A | 72 | 0 | 0 | .. | .. | Between St. Arnaud and Bell Rock | 2 to 3 feet | .. | .. | 27.2.1871 | Theodore Cerrel .. | P. Simpson, Mining Surveyor, Nugget Book | Found in red clay and associated with blue slate and quartz |
| 550 | A | 72 | 0 | 0 | .. | 41 17 0 | Boots Gully, Parish of Wombat | 10 feet | .. | .. | 3.5.1884 | Thompson Brothers .. | Nugget Book .. | Associated with quartz |
| 551 | A | 72 | 0 | 0 | .. | .. | Potter's Hill, Wedderburne | 2 feet | .. | .. | .. | Reach's party .. | O. A. L. Whitelaw, Memoir No. X., p. 12 | |
| 552 | A | .. | | | .. | 71 15 0 | Sporting Flat, Dunolly | 16 feet | .. | .. | 25.4.1871 | J. H. French and T. Snow | F. K. Orme, Warden, Nugget Book | |
| 553 | A | 71 | 0 | 0 | .. | .. | Bocca Flat, Wedderburne | 8 feet | .. | .. | 1858 | James Pretty .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 554 | A | 71 | 0 | 0 | 71 0 0 | .. | Berlin Flat, Kangderaar | 8 inches | .. | .. | 5.8.1870 | J. Lidster and party | F. K. Orme, Warden, Nugget Book | All gold |
| 555 | A | 71 | 0 | 0 | 64 3 0 | .. | Old Inglewood .. | 18 feet | .. | .. | 2.11.1881 | W. Brooker and party | Nugget Book .. | Associated with cement |
| 556 | A | 70 | 0 | 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | —.12.1865 | .. | Dicker's Mining Record, December, 1865, p. 409 | |
| 557 | A | 70 | 0 | 0 | .. | .. | Nuggetty Gully, Dunolly | 4 feet | .. | .. | 1866 | .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |

## List of Nuggets found in Victoria—*continued*.

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 558 | A | 70 0 0 | .. | .. | Gooseberry Flat, Dunolly | 50 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |
| 559 | A | 70 0 0 | 70 0 0 | .. | Berlin, Kangderaar | 6 inches | .. .. | 4.8.1870 | James Lidster and party | F. K. Orme, Warden, Nugget Book | All gold |
| 560 | A | 70 0 0 | .. | 60 0 0 | Hepburn Estate Mine, Smeaton | .. | .. .. | 28.1.1888 | Hepburn Estate Mining Co. | Nugget Book .. .. | Found in the sluice-box |
| 561 | A | 70 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | Hertmann and party | Nugget Book | |
| 562 | A | 70 0 0 | .. | .. | Nuggetty shaft, Elysian Flat, Neilborough | 10 to 20 feet | .. .. | .. | .. .. .. | H. S. Whitelaw's Map of Raywood, 1904 | |
| 563 | A | 70 0 0 | .. | .. | Old Madam Berry Mine, Creswick | .. | .. .. | prior to —.1.1905 | Old Madam Berry Mining Co. | Nugget Book | |
| 564 | Q | 70 0 0 | .. | 25 0 0 | North Woah Hawp Mine, Ballarat | 840 feet | .. .. | —.10.1909 | North Woah Hawp Mining Co. | *Age* Newspaper, 2nd October, 1909 | On indicator |
| 565 | Q | 70 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 feet | .. .. | —.3.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 5th March, 1910 | On indicator |
| 566 | A | 70 0 0 | .. | .. | Reach's Claim, Wedderburne | .. | .. .. | .. | Reach's party .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | |
| 567 | A | 70 0 0 | .. | .. | Wedderburne .. | .. | .. .. | 1876 | T. Linkleter .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 568 | A | 70 0 0 | .. | .. | Turkey Flat, Dunolly | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 569 | A | 70 0 0 | .. | .. | Bismarck Lead, Dunolly | About 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 570 | A | 69 5 0 | .. | 65 10 0 | Green Gully, 8 miles south of Fryerstown, Holcombe | 30 feet | .. .. | —.9.1869 | Charles Lilford, jun. | Mark Amos, Mining Surveyor, Nugget Book | Found on a white soft sandstone bottom |
| 571 | A | 69 0 0 | .. | 65 10 0 | Tyler's Rush, Berlin, Kangderaar | 12 feet | .. .. | 2.2.1870 | J. Scott and party .. | F. K. Orme, Warden, Nugget Book | Associated with ironstone |
| 572 | A | 68 17 0 | .. | .. | Ryrie's Freehold Mine, Creswick | .. | .. .. | —.12.1876 | Ryrie's Freehold Co. | Progress Report No. VI., p. 35 | |
| 573 | A | 68 10 0 | .. | 65 12 0 | Johnstown, Berlin, Kangderaar | 8 feet | .. .. | 23.11.1870 | Solomon Schlossman and party | H. J. Hughes, Mining Registrar, Nugget Book | The nugget was in shape like a dome |
| 574 | A | 68 0 0 | .. | 67 10 0 | Kitty's Lead, Buninyong | 4½ feet | .. .. | 17.10.1870 to 19.12.1870 | Robert Miller and party | Nugget Book .. .. | Found in red clay. Nearly pure gold |
| 575 | A | 68 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |
| *576 | A | 68 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 78 feet | .. .. | —.7.1910 | "Dividend Syndicate" | A. M. Howitt .. .. .. | Associated with pinkish quartz |
| 577 | A | 67 12 0 | .. | .. | Spring Gully, Fryer's Creek | Shallow | .. .. | —.6.1865 | .. .. .. | Dicker's Mining Record, June, 1865, p. 330 | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 578 | A | 67 10 0 | .. | .. | Corinella Extended Mine, Egunstown, Daylesford | About 30 feet | .. | .. | 19.1.1895 | Corinella Extended Mining Co. | W. Trenkner, Mining Registrar, Nugget File | |
| 579 | A | 67 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 580 | A | 66 10 0 | .. | .. | Positano Syndicate, Poseidon Lead, Tarnagulla | 72 feet | .. | .. | —.4.1909 | Dickenson, Kelsall, and party | *Age* Newspaper, 5th April, 1909 | |
| 581 | A | 66 3 0 | .. | 40 0 0 | Near City of Bath Reef, Inglewood | Surface | .. | .. | 20.5.1884 | John Blenkworth .. | Mining Registrars' and Surveyors' Reports, June, 1884, p. 19 | Associated with quartz |
| 582 | A | 66 0 0 | .. | .. | Pound Rush, Dunolly District | 30 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 583 | A | 66 0 0 | 66 0 0 | .. | Berlin, Kangderaar | 15 feet | .. | .. | 19.8.1870 | P. Anglam and party | F. K. Orme, Warden, Nugget Book | Pure gold, and honeycombed |
| 584 | A | 65 18 0 | .. | 65 0 0 | Black Jack's Gully and Judy Point, Wedderburne | 6 inches | .. | .. | 4.6.1891 | Charles Rose .. | O. A. L. Whitelaw's Quarter Sheet Map No. 63D, S.W. | Found in red clay. Associated with ironstone |
| 585 | A | 65 17 0 | .. | 60 0 0 | Commissioners' Flat, Fryerstown, Fryer's Creek | 15 feet | .. | .. | 1859 | The Ballaarat Mining Co. | Progress Report No. III., p. 118 | In shape like a hand |
| 586 | Q | 65 10 0 | 65 10 0 | .. | Matrix Co., McIntyre's, Moliagul | .. | .. | .. | —.11.1865 | The Matrix Mining Co. | Dicker's Mining Record, November, 1865, p. 322 | Specimens from quartz leader |
| 587 | A | 65 3 0 | .. | 48 4 0 | No locality given .. | .. | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 588 | A | 65 0 0 | .. | .. | Chinaman's Flat, Maryborough | Deep | .. | .. | —.12.1877 | East Duke Co-operative party | Mining Surveyors' Reports, December, 1877, p. 23 | |
| 589 | Q | 65 0 0 | .. | .. | Britannia United Mine, Ballaarat | 480 feet | .. | .. | .. | Britannia United Mining Co. | J.W. Gregory, Memoir No. IV., p. 8 | 45 feet east of an indicator |
| 590 | A | 65 0 0 | .. | 42 15 0 | Golden Age Mine. Stockyard Creek, Foster | 47 feet | .. | .. | 17.6.1872 | The Golden Age Mining Co. | E. W. Turner, Mining Surveyor, Nugget Book | Flat, in shape like a man's hand, with quartz on one side |
| 591 | A | 64 8 0 | .. | .. | Sailor's Gully, Bendigo | Surface | .. | .. | —.5.1866 | William Harper .. | Dicker's Mining Record, May, 1866, p. 340 | |
| 592 | A | 64 0 0 | .. | .. | Godfrey's Creek, about 6 miles N.E. of Molesworth, Alexandra District | .. .. | .. .. | .. .. | —.1.1869 | .. .. .. | Dicker's Mining Record, January, 1869 | |
| 593 | A | 64 0 0 | .. | .. | Between Bell Rock and St. Arnaud | 2 to 3 feet | .. | .. | 30.2.1871 | Theodore Cerrel .. | P. Simpson, Mining Surveyor, Nugget Book | Found in red clay on a slope of a hill. Associated with blue slate and quartz |
| 594 | A | 64 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |
| 595 | A | 64 0 0 | .. | .. | Tyler's Rush, Berlin, Kangderaar | 2½ feet | .. | .. | 13.1.1870 | William Wannick .. | F. K. Orme, Warden, Nugget Book | |
| 596 | A | 64 0 0 | .. | 19 10 0 | Stockyard Creek, Foster | 47 feet | .. | .. | 3.10.1873 | Prospectors' Company | G. C. Coulson, Mining Registrar, Nugget Book | Associated with pyrites, galena, and mundic in a quartz boulder |
| 597 | A | 63 19 0 | .. | .. | Rokewood .. | .. | .. | .. | 4.11.1904 | .. .. .. | Nugget Book .. .. | Associated with quartz |
| 598 | A | 63 17 0 | .. | 61 10 0 | Break - of - Day, Rokewood | 18 feet | .. | .. | 19.8.1873 | Turner and party .. | G. Perry, Mining Registrar, Nugget Book | Smooth and waterworn |
| 599 | A | 63 5 0 | 49 4 0 | .. | Blacksmith's Gully, Amherst | 6 inches | .. | .. | 1.7.1875 | James Brogan .. | Progress Report No. III., p. 119 | |
| 600 | A | 63 0 0 | .. | .. | Gooseberry Flat, Dunolly | 40 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 601 | A | 63 0 0 | .. | .. | Tyler's Rush, Berlin, Kangderaar | Shallow | .. | .. | 12.1.1870 to 24.3.1870 | .. .. .. | F.K. Orme, Warden, Nugget Book | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 602 | Q | 63 0 0 | — | .. | New Normanby Mine, Ballaarat | 1,300 feet | .. .. | —.8.1908 | New Normanby Mining Co. | *Age* Newspaper, 21st August, 1908 | On indicator |
| 603 | Q | 63 0 0 | — | .. | Llanberris Mine, Ballaarat | 453 feet | .. .. | .. | Llanberris Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On the Pencil Mark Indicator |
| 604 | A | 62 0 0 | — | .. | Caledonia Gully, Heathcote | Surface | .. .. | —.10.1859 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 139 | |
| 605 | A | 62 0 0 | .. | .. | Quaker's Gully, Dunolly District | 10 feet | .. .. | 1857 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 606 | A | 62 0 0 | .. | .. | Chiltern Division .. | Shallow | .. .. | .. | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 194 | |
| 607 | A | 62 0 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | — .. | 1868 | .. .. .. | F. K. Orme, p. 375 R. B. Smyth's Gold-fields, &c. | |
| 608 | A | 62 0 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | — .. | 1868 | .. .. .. | F. K. Orme, p. 375 R. B. Smyth's Gold-fields, &c. | |
| 609 | A | 61 18 0 | .. | 34 17 0 | No locality given .. | .. | .. .. | 1855 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 610 | A | 61 18 0 | .. | 61 5 0 | Humbug Hill, Berlin, Kangderaar | 6 inches | .. .. | 22.8.1872 | .. .. .. | H. J. Hughes, Mining Registrar, Nugget Book | |
| 611 | A | 61 5 0 | 41 8 0 | .. | Rising Sun Claim, Ballaarat | 130 feet | .. .. | 11.12.1878 | John Conway and party | Progress Report No. VI., p. 35 | |
| *612 | A | 61 1 0 | 59 17 0 | .. | Boort, near Lake Yando | Surface | "The Boort" .. | 18.7.1881 | School Children named Petersen | Roach Stephens, Mining Registrar, Nugget Book | |
| 613 | A | 61 0 0 | .. | .. | Bigg's Gully, Dunolly District | Surface | — .. | —.—.1868 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | Found in red clay |
| 614 | A | 61 0 0 | .. | .. | Ballaarat Freehold Mine, Ballaarat | About 250 feet | — .. | —.7.1867 | Ballaarat Freehold Mining Co. | Dicker's Mining Record, July, 1867, p. 17 | |
| 615 | Q | 61 0 0 | .. | 45 0 0 | Commissioners' Flat, Fryerstown | 265 feet | .. .. | 9.10.1874 | Philip Rowe, Manager, Fryers Mining Co. | Progress Report No. II., p. 58 .. | Found in quartz vein, 18 inches wide |
| 616 | A | 61 0 0 | 53 16 12 | .. | Near Christmas Reef, Raywood | 7 feet | — .. | 10.6.1880 | Mark Phillips .. | Progress Report No. VII., p. 125 | Resembling a clinker, and associated with quartz |
| *617 | A | 61 0 0 | .. | .. | McIvor Hydraulic Dredging Co., Heathcote | Shallow | — .. | 11.6.1906 | McIvor Hydraulic Dredging Co. | Nugget Book | |
| 618 | A | 60 10 0 | .. | 60 0 0 | Little Bendigo, Ballaarat | 25 feet | — .. | 14.1.1881 | A party of Chinese .. | Progress Report No. VII., p. 125 | |
| 619 | A | 60 9 0 | .. | 33 12 0 | No locality given .. | .. | — .. | 1854 | .. .. .. | W. Birkmyre, p. 369 R. B. Smyth's Gold-fields, &c. | |
| 620 | A | 60 0 0 | 56 18 0 | .. | Poseidon Lead, Tarnagulla | 71 feet | "Burkank's Pride" | —.9.1908 | Burbank, Brett, and party | *Age* Newspaper, 12th September, 1908 | |
| 621 | Q | 60 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | — .. | —.9.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 30th September, 1910 | On indicator |
| 622 | Q | 60 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 feet | — .. | —.3.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 4th March, 1910 | On indicator |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 623 | Q | 60 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.4.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 23rd April, 1910 | On indicator |
| 624 | A | 60 0 0 | .. | .. | Working Miners' Claim, Homebush | 170 feet | .. | .. | —.12.1877 | Working Miners' party | Mining Surveyors' Reports, December, 1877, p. 31 | |
| 625 | A | 60 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 626 | A | 60 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 627 | A | 60 0 0 | .. | .. | Near Herbert's Orchard, south of Wattle Flat, Dunolly | 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 628 | A | 60 0 0 | .. | .. | Near Ironstone Hill, Bendigo | 1½ feet | .. | .. | About 18.6.1875 | .. .. .. | Progress Report No. III., p. 119 | Found in red clay |
| 629 | A | 60 0 0 | .. | 20 0 0 | Mt. Alexander Diggings, Campbell's Creek, Castlemaine | Shallow | .. | .. | 1853 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 59 | About two-thirds white quartz and one-third gold |
| 630 | A | 60 0 0 | .. | .. | Patchy Flat Hill, Dunolly | 60 feet | .. | .. | 1865 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 631 | A | 60 0 0 | .. | .. | Cleeland's Gully, Berlin, Kangderaar | 3½ feet | .. | .. | —.10.1868 | .. .. .. | Dicker's Mining Records, October, 1868, p. 93 | |
| 632 | A | 60 0 0 | .. | .. | Nuggetty Gully, Dunolly | 4 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 633 | Q | 60 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.8.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 14th August, 1909 | On indicator |
| 634 | A | .. | .. | 60 0 0 | Berlin Rush, Kangderaar | 20 feet | .. | .. | 6.4.1869 | Craig and party .. | R. Mason, Mining Registrar, Nugget Book | |
| 635 | A | 60 0 0 | .. | .. | Nick-o'-Time Lead, Tarnagulla | 100 feet | .. | .. | 26.4.1905 | Star of Loddon Claim | A. M. Howitt, Records, Vol. III., Part 1 | |
| 636 | A | 60 0 0 | .. | .. | Gooseberry Flat, Dunolly | 50 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 637 | A | .. | .. | 60 0 0 | Godfrey's Creek, about 6 miles N.E. of Molesworth, Alexandra District | .. .. | .. | .. | —.1.1869 | Edwards and party .. | A. P. Akehurst, Warden, Nugget Book | |
| 638 | A | 60 0 0 | .. | .. | Blue Gully, Blackwood | 5 feet | .. | .. | 16.7.1908 | Alfred Bennett .. | Nugget Book .. .. | In 1896, a 130-oz. nugget was found in this locality |
| 639 | A | 60 0 0 | .. | .. | Old Tom Gully, Parish of Wombat | About 20 feet | .. | .. | —.12.1870 | Dunmore and party | Mining Surveyors' Reports, December, 1870, p. 37 | |
| 640 | A | 60 0 0 | .. | .. | Wingfield's Gully, Beaufort | 20 feet | .. | .. | .. | A party of Chinese .. | E. Lidgey, Special Report | |
| 641 | A | 60 0 0 | .. | .. | Hepburn, Daylesford | .. | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 378 R. B. Smyth's Gold-fields, &c. | |
| 642 | A | 60 0 0 | .. | .. | Potter's Hill, Wedderburne | Shallow | .. | .. | .. | .. .. .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 643 | A | 60 0 0 | .. | .. | At Raywood .. | .. | .. | .. | —.1.1864 | .. .. .. | Dicker's Mining Record, January, 1864, p. 3 | |
| 644 | A | 60 0 0 | .. | .. | White Patch, Wattle Flat, Dunolly | 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 645 | A | 60 0 0 | .. | .. | Sons of Freedom Mine, Ballaarat | 300 feet | .. | .. | —.10.1865 | Sons of Freedom Mining Co. | Dicker's Mining Record, October, 1865, p. 278 | |
| 646 | A | 60 0 0 | .. | .. | Woolshed Lead, Poseidon | About 20 feet | .. | .. | .. | .. .. .. | A. M. Howitt | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 647 | A | 60 0 0 | .. | .. | Langham Flat, Kangderaar | 9 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 648 | A | 60 0 0 | .. | .. | Chapel Gully, Rheola, Kingower | Shallow | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 649 | A | 60 0 0 | .. | .. | Christmas Flat, Rheola, Kangderaar | 6 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 650 | A | 60 0 0 | .. | .. | O'possum Gully, Rheola, Kangderaar | 6 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 651 | A | 60 0 0 | .. | .. | East of Cater's Hill, and northof Humbug Hill, Moliagul | 3 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 652 | A | 59 17 0 | .. | 57 17 6 | Old Tom's Gully, Parish of Wombat | 8 inches | .. .. | 15.11.1873 | Celeste Lafranchi .. | Progress Report No. II., p. 58 | |
| 653 | A | 59 10 0 | .. | 58 5 6 | Board of Advice Claim, Buninyong | 73 feet | .. .. | 21.7.1875 | Board of Advice Claim | Progress Report No. III., p. 119 | In shape like a pyramid |
| *654 | A | 59 10 0 | 40 0 0 | .. | Nick-o'-Time Rush, Tarnagulla | 25 feet | .. .. | 16.10.1903 | Yeo, Hatt, and Bravo | Nugget Book | |
| 655 | A | 59 0 0 | .. | .. | Berlin Diggings, Kingower | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 656 | A | 59 0 0 | .. | .. | Berlin Diggings, Kingower | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 657 | A | 59 0 0 | .. | .. | Berlin Diggings, Kingower | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 658 | A | 58 18 0 | .. | .. | No locality given .. | .. | .. .. | Prior to 7.1.1852 | .. .. .. | W. Birkmyre, p. 369 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria. | |
| 659 | A | 58 0 0 | .. | 52 0 0 | Star Hill, Talbot .. | 6 feet | .. .. | 3.7.1871 | T. Thomas .. | J. Smith, Mining Registrar, Nugget Book | Honeycombed, and associated with quartz, gravel, and cement |
| 660 | A | 58 0 0 | .. | .. | Store Creek, Nicholson River, Gippsland | .. | .. .. | —.1.1861 | .. .. .. | W. Birkmyre, p. 370 R. Brough Smyth's Gold-fields, &c. | |
| 661 | A | 58 0 0 | .. | .. | Berlin Flat, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| *662 | A | 58 0 0 | 55 0 0 | .. | Boots Gully, Parish of Wombat | 15 feet | .. .. | 25.8.1888 | Leopold and party .. | Nugget Book | |
| 663 | A | 58 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. Brough Smyth's Gold-fields, &c. | |
| 664 | A | 58 0 0 | .. | .. | Berlin Flat, Kangderaar | 12 feet | .. .. | —.11.1869 | .. .. .. | F. K. Orme, Nugget Book | |
| 665 | A | 57 15 0 | .. | 40 2 0 | No locality given .. | .. | .. .. | 1855 | .. .. .. | W. Birkmyre, p. 370 R. Brough Smyth's Gold-fields, &c. | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 666 | A | 57 | 15 | 0 | .. | .. | Old Tom Gully, Parish of Wombat | About 20 feet | .. | .. | —.12.1873 | .. | .. | .. | Mining Surveyors' Reports, December, 1873, p. 35 | |
| 667 | A | 57 | 5 | 10 | .. | .. | Berlin, Kangderaar | 9 feet | .. | .. | 12.1.1870 to 24.3.1870 | .. | .. | .. | F. K. Orme, Warden, Nugget Book | |
| 668 | A | 57 | 3 | 12 | .. | 55 6 0 | Norfolk Gully Rush, Amherst | 45 feet | .. | .. | 16.3.1876 | Webb and Shepherd | .. | | Progress Report No. IV., p. 49 | Nearly spherical |
| 669 | A | 57 | 0 | 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | .. | .. | Prior to 31.12.1868 | .. | .. | .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 670 | A | 57 | 0 | 0 | .. | 56 0 0 | Golden Point, Fryerstown | Surface | .. | .. | —.4.1852 | John Banner | .. | | Progress Report No. III., p. 118 | |
| 671 | A | 57 | 0 | 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | .. | .. | .. | .. | .. | .. | .. | Mining Surveyors' Reports, p. 377 R. Brough Smyth's Gold-fields, &c. | |
| 672 | A | 57 | 0 | 0 | .. | .. | Bismarck Lead, Dunolly | 20 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | |
| 673 | Q | 57 | 0 | 0 | .. | .. | Black Hill Flat, Ballaarat East | 400 feet | .. | .. | 16.2.1876 | United Black Hill Mining Co. | | | Nugget Book .. .. | In three nuggets; on the eastern indicator, from 5 to 10 feet above the bedrock |
| 674 | A | 56 | 0 | 0 | .. | .. | Old Lead, Dunolly | 30 feet | .. | .. | 1867 | .. | .. | .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 675 | A | 56 | 0 | 0 | .. | .. | Scotchman's Gully, Dunolly | 15 feet | .. | .. | 1863 | .. | .. | .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 676 | A | 56 | 0 | 0 | .. | .. | Scotchman's Gully, Dunolly | 15 feet | .. | .. | 1863 | .. | .. | .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 677 | A | 56 | 0 | 0 | .. | .. | Happy Valley or Cobbler's Gully | .. | .. | .. | —.12.1880 | .. | .. | .. | Mining Surveyors' Reports, December, 1880, p. 36 | In two nuggets |
| 678 | A | 56 | 0 | 0 | .. | .. | Baker's Orchard, Jones' Creek, Waanyarra | 20 feet | .. | .. | 1903 | .. | .. | .. | Nugget Book | |
| 679 | A | 56 | 0 | 0 | .. | .. | Nursery Flat, Wedderburne | About 20 feet | .. | .. | .. | .. | .. | .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 680 | A | 56 | 0 | 0 | .. | .. | Township of Wedderburne | About 30 feet | .. | .. | .. | .. | .. | .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 681 | A | 56 | 0 | 0 | .. | .. | German Reef Gully, Franklinford | 9 feet | .. | .. | .. | .. | .. | .. | G. Ulrich's Quarter-sheet Map, No. 15, S.E. | |
| 682 | A | 56 | 0 | 0 | .. | .. | Berlin Rush, Kangderaar | 12 feet | .. | .. | 12.3.1869 | .. | .. | .. | F. K. Orme, Warden, Nugget Book | |
| 683 | A | 55 | 0 | 0 | .. | 54 0 0 | Break-of-Day, Rokewood | 30 feet | .. | .. | 29.1.1903 | T. O'Loughlin | .. | | Nugget Book .. .. | Flat, with a hole through it |
| 684 | A | 55 | 0 | 0 | .. | .. | Tinpot Gully, Wedderburne | .. | .. | .. | 1860 | George Dupuy | .. | | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 685 | A | 55 | 0 | 0 | .. | .. | Finn's Flat, Wedderburne | .. | .. | .. | 1860 | John Finn .. | .. | | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 686 | A | 55 | 0 | 0 | .. | .. | Finn's Flat, Wedderburne | .. | .. | .. | 1860 | John Finn .. | .. | | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 687 | A | 55 | 0 | 0 | .. | 54 0 0 | Welcome Gully, Maryborough | 4 feet | .. | .. | 19.10.1871 | Alfred Cole | .. | | Peter Virtue, Mining Registrar, Nugget Book | |
| 688 | A | 55 | 0 | 0 | .. | .. | Black Jack's Gully, Wedderburne | About 20 feet | .. | .. | .. | .. | .. | .. | O. A. L. Whitelaw's Quarter-sheet Map, No. 63D, S.W. | |
| 689 | A | 55 | 0 | 0 | .. | 51 0 0 | Green Gully, 8 miles south of Fryerstown, Parish of Holcombe | 30 feet | .. | .. | 26.3.1870 | William Lilford | .. | | Mark Amos, Mining Surveyor, Nugget Book | Found close to where No. 523 was obtained |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| *690 | A | 55 0 0 | .. | .. | Irishman's Claim, Nick - o' - Time Lead, Tarnagulla | 50 feet | .. .. | 6.4.1905 | Hayes, Firth, and party | Nugget Book | |
| 691 | A | 55 0 0 | .. | .. | Berlin Diggings, Kingower | Shallow | .. .. | .. | .. .. .. | F. K. Orme, p. 375 R. B. Smyth's Gold-fields, &c. | |
| *692 | A | 55 0 0 | .. | 50 0 0 | Madam Berry West Mine, Creswick | Deep | .. .. | —.1.1905 | Madame Berry West Mining Co. | Nugget Book | |
| 693 | Q | 55 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 840 feet | .. .. | —.10.1909 | North Woah Hawp Mining Co. | *Age* Newspaper, 4th October, 1909 | On indicator |
| 694 | A | 55 0 0 | .. | .. | Whipstick, Raywood | .. | .. .. | 10.9.1879 | J. Henston .. | H. S. Whitelaw .. .. | |
| 695 | A | 55 0 0 | .. | .. | Poseidon United Syndicate, Poseidon | 80 feet | .. .. | 27.4.1911 | Poseidon United Syndicate | Nugget Book | |
| 696 | A | 55 0 0 | .. | .. | Long Gully, Wedderburne | Shallow | .. .. | 1858 | John Horton .. | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| 697 | A | 55 0 0 | .. | .. | Judy Point, Wedderburne | About 20 feet | .. .. | 1863 | Trotman and Hayes | O. A. L. Whitelaw, Memoir No. X., p. 11 | |
| *698 | A | 54 13 14 | .. | 54 1 14 | Godfrey - Street Claim, Wedderburne | 18 feet | .. .. | 11.4.1904 | Gabriel Duckett .. | Nugget Book .. .. | |
| 699 | A | 54 12 0 | .. | 38 1 6 | Neighbourhood of Dunolly | 5½ feet | .. .. | 29.8.1874 | Thomas Storey .. | Progress Report No. II., p. 58 .. | |
| 700 | A | 54 5 0 | .. | 54 0 0 | Mount Prospect, Bullarook | 6 inches | .. .. | —.4.1870 | .. .. .. | T. Hale, Mining Registrar, Nugget Book | Found by a ploughman on Mr. Allan's farm |
| 701 | A | 54 0 0 | .. | .. | Snake Gully, Old Lead, Dunolly | 40 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 702 | A | 54 0 0 | .. | .. | Evans' Gully, Glenalbyn, near Kingower | Shallow | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377. R. B. Smyth's Gold-fields, &c. | |
| 703 | A | 54 0 0 | .. | .. | Near Old Nursery Gully, ¼ mile east of Wedderburne Township | .. | .. .. | 24.5.1897 | .. .. .. | J. Roach, Mining Registrar, Nugget File | |
| 704 | A | 54 0 0 | 47 2 0 | .. | Catto's Paddock, Berlin, Kangderaar | 12 feet | .. .. | 4.11.1875 | Peter Apple and Phillips | Progress Report No. IV., p. 49 .. | On granite bedrock |
| 705 | A | 54 0 0 | .. | .. | 1 mile west of Keep-it-Dark Reef, Daylesford | Shallow | .. .. | —.9.1889 | .. .. .. | Mining Registrars' Reports, September, 1889, p. 25 | |
| 706 | A | 53 18 0 | .. | .. | Homebush, Avoca | 135 feet | .. .. | 18.12.1870 | Golden Lake Co.'s Tributers | P. Simpson, Mining Surveyor, Nugget Book | Honeycombed and associated with cemented sand and clay |
| *707 | A | 53 5 0 | .. | 52 10 0 | Nick-o'-Time Lead, Tarnagulla | 15 feet | .. .. | 8.9.1903 | Yeo, Hatt, and party | A. M. Howitt, Records, Vol. III., Part 1 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 708 | A | 53 0 0 | 53 0 0 | .. | Spring Hill, Creswick | 190 feet | .. | .. | 6.3.1875 | Western Lewers Freehold Mining Co. | J. Stevenson, Mining Surveyor, Nugget Book | All gold |
| 709 | A | 53 0 0 | .. | 42 14 0 | Key Company's Mine, Creswick | 150 feet | .. | .. | 28.4.1874 | Key Mining Co. .. | J. Stevenson, Mining Surveyor, Nugget Book | |
| 710 | Q | 53 0 0 | .. | .. | No. 1 Llanberris Mine, Ballaarat | 453 feet | .. | .. | .. | .. .. .. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 711 | Q | .. | .. | 53 0 0 | Spring Gully Mine, Castlemaine | .. | .. | .. | 30.11.1904 | Spring Gully Mining Co. | Nugget Book | |
| 712 | A | 53 0 0 | 44 10 0 | .. | Poseidon Lead, Tarnagulla | 71 feet | .. | .. | 21.9.1908 | Burbank and party .. | A. M. Howitt | |
| 713 | A | 53 0 0 | .. | .. | Alexandra Co.'s Mine, Ballaarat | .. | .. | .. | —.4.1866 | Alexandra Mining Co. | Dicker's Mining Record, April, 1866, p. 252 | In two nuggets |
| 714 | A | 53 0 0 | .. | .. | Phipp's Flat, Blackwood | .. | .. | .. | .. | Gunner and party .. | Mining Surveyors' Reports, p. 376 R. B. Smyth's Gold-fields, &c. | |
| *715 | A | 52 10 0 | .. | 50 0 0 | 3 miles west of Mount Tarrengower | Surface | .. | .. | 24.2.1905 | James Waterson .. | H. S. Whitelaw .. .. | On granite country. This nugget was probably transported by blacks |
| 716 | A | 52 10 0 | .. | .. | Kangaroo Flat, Talbot | .. | .. | .. | —.6.1862 | .. .. .. | Dicker's Mining Record, June, 1862, p. 3 | |
| 717 | A | 52 6 0 | .. | .. | Berlin, Kangderaar | Shallow | .. | .. | 15.6.1869 | Skinner and party .. | R. Mason, Mining Registrar, Nugget Book | |
| 718 | A | 52 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 719 | Q | 52 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.4.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 23rd April, 1910 | On indicator |
| 720 | A | 52 0 0 | .. | .. | Little Chinaman's Flat, Dunolly | 15 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 721 | A | 52 0 0 | .. | .. | Sheepyard Gully, Kangderaar | 9 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 722 | A | 52 0 0 | .. | .. | Clover's Gully, Dunolly | 14 feet | .. | .. | 1863 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| *723 | A | 52 0 0 | 44 1 0 | .. | Poverty Reef, Tarnagulla | Surface | .. | .. | 13.8.1880 | Boan and Morton .. | Progress Report No. VII., p. 125 | |
| 724 | A | 52 0 0 | .. | .. | Hard Hill, Dunolly | Shallow | .. | .. | —.6.1877 | .. .. .. | W. G. Couchman, Mining Surveyor, Quarterly Report, June, 1877, p. 32 | |
| 725 | A | 52 0 0 | .. | .. | Patchy Flat Hill, Dunolly | 60 feet | .. | .. | 1865 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 726 | Q | 52 0 0 | .. | .. | Holloway's Enterprise Reef, Wedderburne | 140 feet | .. | .. | 1889 | .. .. .. | O. A. L. Whitelaw, Memoir No. X., p. 22 | |
| 727 | A | 52 0 0 | .. | .. | Quakers' Gully, Dunolly | 10 feet | .. | .. | 1857 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 728 | A | 52 0 0 | .. | .. | Wattle Flat, Dunolly | About 17 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 729 | A | 52 0 0 | .. | .. | Western or White Lead, Dunolly | About 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 730 | A | 52 0 0 | .. | 44 1 2 | Spring Gully, Bendigo | 4 inches | .. | .. | 22.1.1873 | Barber and Farley .. | N. G. Stephens, Mining Surveyor, Nugget Book | Flat nugget, and associated with quartz and gravel |
| 731 | A | 51 17 12 | 47 1 0 | .. | No locality given .. | .. | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 370 R. Brough Smyth's Gold-fields, &c. | |
| 732 | A | 51 11 4 | .. | 50 10 0 | Jackson's Gully, Berlin, Kangderaar | 9 feet | .. | .. | 12.1.1870 to 24.3.1870 | N. Sanderson .. | F. K. Orme, Warden, Nugget Book | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 733 | A | 51 4 0 | .. | .. | Poseidon Lead, Tarnagulla | 72 feet | .. .. | 3.2.1908 | Mackenzie and party | A. M. Howitt.. .. .. | Much quartz attached |
| 734 | A | 51 0 0 | .. | .. | Peep-of-Day, Wedderburne | .. | .. .. | 1859 | Sanders .. .. | O. A. L. Whitelaw, Memoir No. X., p. 11. | |
| 735 | A | 51 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | I. Pallat .. .. | Nugget Book .. .. | |
| 736 | A | 51 0 0 | .. | .. | Chinaman's Flat Lead, Township of Timor | About 120 feet | .. .. | —.5.1867 | Magnum Bonum Extended Mining Co. | Dicker's Mining Record, May, 1867, p. 213 | |
| *737 | A | 50 19 0 | 50 0 0 | .. | Chinaman's Flat, Maryborough | Deep | .. .. | 1.2.1877 | Band of Hope Mining Co. | Progress Report No. V., p. 43 .. | Smooth and waterworn |
| *738 | A | 50 7 0 | .. | 50 6 0 | Springhill, Creswick | 190 feet | "Hobart Pasha" | 7.8.1878 | Ryrie's Junction Mine | Progress Report No. VI., p. 35 .. | In quartz wash, below basalt |
| 739 | A | 50 6 0 | .. | 26 6 0 | Kimberley, Avoca | 23 feet | .. .. | 11.1.1873 | Richard Moore and party | P. Simpson, Mining Surveyor, Nugget Book | Associated with quartz and ironstone |
| 740 | A | 50 0 0 | .. | .. | Rheola, Berlin, Kangderaar | 7 feet | .. .. | .. | — Wilcox .. .. | W. H. Coffey, Mining Registrar, Nugget Book | In shape, oblong |
| 741 | A | 50 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | Smith and Mason .. | Nugget Book | |
| 742 | A | 50 0 0 | .. | .. | Koh-i-noor Mine, Ballaarat | .. | .. .. | —.7.1868 | Koh-i-noor Mining Co. | Dicker's Mining Record, July, 1868, p. 31 | |
| 743 | A | 50 0 0 | .. | .. | Prospector's Tribute Claim, Foster | 50 feet | .. .. | Prior to 8.11.1876 | Prospector's tribute party | G. R. Murphy, Mining Registrar, Nugget Book | |
| 744 | A | 50 0 0 | .. | .. | Hatters' Gully, Dunolly | About 20 feet | .. .. | 1865 | .. .. .. | W. H. Ferguson's Report | |
| 745 | A | 50 0 0 | .. | .. | Koh-i-noor Mine, Ballaarat | 400 feet | .. .. | —.1.1862 | Koh-i-noor Mining Co. | Dicker's Mining Record, January, 1862, p. 3 | |
| 746 | A | 50 0 0 | .. | .. | Pound Rush, Dunolly | 30 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 747 | A | 50 0 0 | .. | .. | Great Extended Mine, Ballaarat | About 330 feet | .. .. | —.8.1863 | Great Extended Mining Co. | Dicker's Mining Record, August, 1863, p. 181 | Thickness of wash, 7 feet |
| 748 | A | 50 0 0 | 50 0 0 | .. | Waterson's Paddock, Parish of Baringhup | Surface | .. .. | 2.10.1904 | James Waterson .. | Nugget Book .. .. | Pure gold |
| 749 | A | 50 0 0 | .. | .. | Gooseberry Flat, Dunolly | 50 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 750 | A | 50 0 0 | .. | .. | Gooseberry Flat, Dunolly | 50 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 751 | A | 50 0 0 | .. | .. | Gooseberry Flat, Dunolly | 50 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 752 | A | 50 0 0 | .. | .. | Bendigo .. .. | .. | .. .. | —.10.1865 | .. .. .. | Dicker's Mining Record, October, 1865, p. 251 | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 753 | A | 50 0 0 | .. | .. | Berlin Rush, Kangderaar | .. | .. | .. | 23.4.1869 | — — .. | R. Mason, Mining Registrar, Nugget Book | |
| *754 | A | 50 0 0 | .. | .. | Well in the Desert Lead, Timor | 90 feet | .. | .. | 1.6.1906 | W. Pollock .. | Nugget Book | |
| 755 | A | 50 0 0 | .. | .. | Turkey Flat, Dunolly | About 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 756 | A | 50 0 0 | .. | .. | Langham Flat, Kangderaar | 9 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 757 | A | 50 0 0 | .. | .. | Gilmore's Gully, Langham Flat, Kangderaar | 9 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 758 | A | 50 0 0 | .. | 48 4 12 | Tyler's Flat, Berlin, Kingower | 9 feet | .. | .. | 17.11.1873 | E. Forrest and John Owens | Progress Report No. II., p. 58 | |
| 759 | A | 50 0 0 | .. | .. | Bismarck Lead, Dunolly | 25 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 760 | A | 50 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | —.12.1873 | .. .. .. | W. H. Ferguson's Report | |
| 761 | A | 50 0 0 | .. | .. | Kingower, Inglewood | About 20 feet | .. | .. | —.6.1888 | .. .. .. | Mining Surveyors' Reports, June, 1888, p. 22 | Obtained from cement |
| 762 | A | 50 0 0 | .. | .. | Wedderburne .. | About 50 feet | .. | .. | —.12.1886 | .. .. .. | Mining Surveyors' Reports, December, 1886, p. 23 | |
| 763 | Q | 50 0 0 | .. | .. | New Year's Flat, Walking Stick Gully, Redbank | 5 feet | .. | .. | 2.9.1902 | John Willett .. | Nugget Book .. .. | Flat thin nugget, from the indicator |
| 764 | A | 50 0 0 | .. | .. | No locality given .. | .. | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 370 R. Brough Smyth's Gold-fields and Mineral Districts of Victoria | |
| 765 | Q | 50 0 0 | 50 0 0 | .. | North Woah Hawp Mine, Ballaarat | 840 feet | .. | .. | —.10.1909 | North Woah Hawp Mining Co. | *Age* Newspaper, 20th October, 1909 | Pure gold, on indicator |
| 766 | Q | 50 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.10.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 29th October, 1909 | On indicator |
| 767 | Q | 50 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.7.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 23rd July, 1910 | On indicator |
| 768 | Q | 50 0 0 | 50 0 0 | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.11.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 25th November, 1910 | Pure gold, on indicator |
| 769 | A | 50 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 72 feet | .. | .. | 31.8.1910 | Positano Claim .. | *Age* Newspaper, 31st August, 1910 | |
| 770 | A | 50 0 0 | 40 0 0 | .. | Poseidon Lead, Tarnagulla | 46 feet | .. | .. | 20.3.1907 | Pola and party .. | A. M. Howitt | |
| 771 | A | 50 0 0 | .. | .. | Wattle Flat, Dunolly | About 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 772 | A | 50 0 0 | .. | .. | Gipsy Flat, Dunolly | About 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 773 | A | 50 0 0 | 23 15 0 | .. | Poseidon Lead, Tarnagulla | 23 feet | .. | .. | 18.12.1906 | Michael and party .. | A. M. Howitt, Records, Vol. III., Part 1 | On the bedrock |
| 774 | A | 50 0 0 | .. | .. | Whipstick, Bendigo | .. | .. | .. | —.12.1868 | .. .. .. | Dicker's Mining Record, December, 1868, p. 152 | In several nuggets |
| 775 | A | 50 0 0 | .. | .. | Poseidon Lead, Tarnagulla | About 85 feet | .. | .. | —.8.1912 | Poseidon United Mining Co. | *Age* Newspaper, 9th August, 1912 | |
| 776 | A | 49 14 12 | .. | 26 2 0 | No locality given .. | .. | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 370 R. B. Smyth's Gold-fields, &c. | |
| 777 | Q | 49 0 19 | .. | 26 15 0 | Tarrengower .. | .. | .. | .. | 1861 | .. .. .. | W. Birkmyre, p. 370 R. B. Smyth's Gold-fields, &c. | |
| 778 | A | 49 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374 R. B. Smyth's Gold-fields, &c. | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 779 | A | .. | .. | 48 5 0 | Right-hand branch of Stony Creek (Mitchell River) | 4 feet | .. .. | 28.3.1869 | Patrick Murphy .. | Mr. Peers, Mining Surveyor, Nugget Book | Found on the edge of bank of an abandoned claim |
| 780 | A | 48 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 4 feet | .. .. | 20.3.1907 | Jackson and Hughes | A. M. Howitt | |
| 781 | A | 48 0 0 | .. | .. | The Nursery, Wedderburne | 5 feet | .. .. | 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 101 | In shape like a pyramid |
| *782 | A | 48 0 0 | .. | .. | Try Again Syndicate's Mine, Rokewood | .. | .. .. | 22.5.1908 | Try Again Syndicate Mining Co. | Nugget Book | |
| 783 | A | 48 0 0 | .. | .. | Nardoo Ranges, Wedderburne | .. | .. .. | —.6.1879 | .. .. .. | Mining Registrars' and Surveyors' Quarterly Reports, June, 1874, p. 39 | |
| 784 | Q | 48 0 0 | .. | .. | No. 1 South Company, Foster | 120 feet | .. .. | —.6.1876 | No. 1 South Mining Company | Mining Surveyors' and Registrars' Reports, June, 1876, p. 38 | |
| 785 | A | 48 0 0 | .. | .. | Pinchgut Gully, Growler's Creek | .. | .. .. | —.9.1889 | .. .. .. | W. H. McDonald, Mining Registrar, Mining Surveyors' and Registrars' Reports, September, 1889, p. 12 | |
| 786 | A | 48 0 0 | .. | 32 15 0 | Billygoat Gully, 1 mile from Kingower Township | Surface | .. .. | 21.9.1884 | A man named Webb .. | Nugget Book | |
| 787 | A | 48 0 0 | .. | .. | Specimen Point, Jones' Creek, Dunolly | 13 feet | .. .. | 22.12.1875 | Edwd. Robinson and Chas. Methven | Progress Report No. IV., p. 49 | |
| 788 | A | 48 0 0 | .. | .. | Great Extended Mine, Ballaarat | About 400 feet | .. .. | —.12.1862 | Great Extended Mining Co. | Dicker's Mining Record, December, 1862 p. 28 | |
| 789 | A | 48 0 0 | .. | .. | Langham Flat, Kangderaar | 9 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890 p. 16 | |
| 790 | A | 48 0 0 | .. | 30 0 0 | Near Hard Hills, between Redbank and Stuart Mill, St. Arnaud | 14 feet | .. .. | —.9.1871 | .. .. .. | Mining Registrars' and Surveyors' Reports, September, 1871, p. 33 | |
| 791 | A | 47 18 0 | .. | .. | Break - of - Day, Rokewood | 10 to 15 feet | .. .. | 15.9.1866 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 792 | A | 47 17 0 | .. | 23 8 0 | No locality given .. | .. | .. .. | 1855 | .. .. .. | W. Birkmyre, p. 370 R. B. Smyth's Gold-fields, &c. | |
| 793 | A | 47 10 0 | .. | .. | Close to the Charleston Amalgamated Mine (in the B.B. Creek), Wood's Point | Shallow | .. .. | —.12.1865 | .. .. .. | Dicker's Mining Record, December, 1865, p. 379 | |
| *794 | A | 47 9 0 | .. | 46 15 0 | Broomfield's Gully, Creswick | 100 feet | .. .. | 12.8.1872 | L. K. Carter and party | J. Stevenson Mining Surveyor, Nugget Book | Found in yellow clay |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 795 | A | 47 9 0 | .. | 45 0 0 | Alma Consols Mine, Maryborough | 120 feet | .. | .. | 31.5.1873 | Alma Consols Mining Co. | P. Virtue, jun., Mining Registrar, Nugget Book | Irregular oval shape, honeycombed and impregnated with black cement and quartz |
| 796 | A | 47 8 0 | .. | 41 6 0 | Kitty's Lead, Buninyong | 1 foot | .. | .. | 26.11.1870 | .. .. .. | Nugget Book | |
| 797 | A | 47 0 0 | .. | .. | Nick-of-Time Lead, Tarnagulla | 17 feet | .. | .. | 5.10.1903 | Yeo, Hatt, and Bravo | A. M. Howitt | |
| 798 | A | 47 0 0 | .. | .. | Catheart Mine, Ararat | 100 feet | .. | .. | 1909 | Catheart Mining Co. | Legal Manager, Catheart Mining Co. | Photograph of nugget obtained |
| 799 | A | 47 0 0 | .. | .. | Pott's Gully, near Wattle Flat, Dunolly | 15 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 800 | A | 47 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. B. Smyth's Gold-fields, &c. | |
| 801 | A | 47 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373, R. B. Smyth's Gold-fields, &c. | |
| *802 | A | 46 15 0 | .. | .. | Crusoe Gully, Bendigo | 3 feet | .. | .. | 13.7.1875 | Marks and McKenzie | Progress Report No. III., p. 119 | Irregular and waterworn |
| *803 | A | 46 6 18 | .. | .. | 3 miles N.E. of Dunolly, Parish of Waanyarra | 14 feet | .. | .. | 23.7.1888 | Imadoe Jerold .. | Nugget Book .. .. | Nearly all gold |
| *804 | A | 46 0 0 | .. | .. | Star of Loddon Mine, Newbridge, Tarnagulla | 100 feet | .. | .. | 10.4.1905 | Star of the Loddon Mining Co. | Nugget Book | |
| 805 | A | 46 0 0 | .. | .. | Gilmore's Gully, Langham Flat | 9 feet | .. | .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 806 | A | 46 0 0 | .. | 44 0 0 | Green Gully, Holcombe, 8 miles south of Fryerstown | 30 feet | .. | .. | —.9.1869 | William Lilford, sen. .. | Mark Amos, Mining Surveyor, Nugget Book | Found on a soft white sandstone bottom |
| 807 | A | 46 0 0 | .. | .. | Neighbourhood of Dunolly | 5½ feet | .. | .. | 29.8.1874 | Thomas Storey .. | W. G. Couchman, Mining Surveyor, Nugget Book | |
| 808 | A | 46 0 0 | .. | .. | Whiskey Lead, Hepburn | .. | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 378, R. B. Smyth's Gold-fields, &c. | |
| 809 | A | 45 18 0 | .. | 45 10 0 | Nicholl's Freehold Mt. Greenock South, Talbot | 110 feet | .. | .. | 1.11.1870 | Nicholl's Freehold Mining Co. | Nugget Book .. .. .. | Nearly all gold |
| 810 | A | 45 0 0 | .. | .. | Near Black Hill Lead, Ballaarat | Surface | .. | .. | 29.11.1857 | Nil Desperandum Mining Co. | J. W. Gregory, Memoir No. IV., p. 7 | |
| 811 | Q | 45 0 0 | .. | .. | Prince Regent Mine, Ballaarat | 554 feet | .. | .. | 1.8.1869 | .. .. .. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 812 | Q | 45 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 750 feet | .. | .. | —.2.1910 | .. .. .. | *Age* Newspaper, 14th February, 1910 | On indicator |
| 813 | A | 45 0 0 | .. | .. | Shoots Gully, between Dunolly and Jones' Creek | Shallow | .. | .. | —.9.1872 | — Davy .. .. | Mining Registrars' and Surveyors' Reports, September, 1872, p. 36 | |
| 814 | A | 45 0 0 | .. | .. | German Gully, Amherst | 4 feet | .. | .. | —.9.1872 | .. .. .. | Mining Registrars' and Surveyors' Reports, September, 1872, p. 35 | |
| 815 | A | 45 0 0 | .. | .. | Green Gully, Holcombe, 8 miles south of Fryerstown | 23 feet | .. | .. | —.7.1869 | W. Lilford and party | Mark Amos, Mining Surveyor, Nugget Book | Nearly pure gold. Very little quartz |
| 816 | A | 45 0 0 | .. | .. | Moliagul .. .. | Shallow | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373, R. B. Smyth's Gold-fields, &c. | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 817 | A | 45 0 0 | .. | .. | Bakery Hill, Ballaarat | 180 feet | .. .. | 13.6.1858 | Red Hill Mining Co. .. | Dicker's Mining Record, February, 1868, p. 36 | Found close to the site of the Welcome Nugget |
| 818 | A | 45 0 0 | .. | .. | Wedderburne .. | Surface | .. .. | About 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, pp. 102 and 103 | |
| 819 | A | 45 0 0 | 45 0 0 | .. | Springhill, Creswick | 196 feet | .. .. | 21.6.1875 | Richardson's Western Freehold Mining Co. | J. Stevenson, Mining Surveyor, Nugget Book | All gold |
| 820 | A | 45 0 0 | .. | .. | Old Lead, Dunolly | About 30 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 821 | A | 44 5 0 | .. | .. | Havelock Mine, Smythesdale | .. | .. .. | —.12.1865 | Havelock Mining Co. | Dicker's Mining Record, December, 1865, p. 399 | |
| 822 | Q | 44 4 6 | .. | 13 2 0 | Tarrengower .. | .. | .. .. | 1860 | .. .. .. | W. Birkmyre, p. 370, R. Brough Smyth's Gold-fields, &c. | Quartz specimen broken off the reef |
| 823 | A | 44 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's Gold-fields, &c. | |
| 824 | A | 44 0 0 | .. | .. | Golden Stream Mine, Scarsdale | 250 feet | .. .. | —.8.1865 | Golden Stream Mining Co. | Dicker's Mining Record, August, 1865, p. 25 | |
| 825 | A | 44 0 0 | .. | .. | Gooseberry Flat, Dunolly | 60 feet | .. .. | —.3.1867 | Prince of Wales Mining Co. | Dicker's Mining Record, March, 1867, p. 165 | |
| 826 | A | 44 0 0 | 44 0 0 | .. | Moliagul .. .. | 5 feet | .. .. | 5.9.1873 | John Scott .. | W. G. Couchman, Mining Surveyor, Nugget Book | Pure gold |
| 827 | A | 44 0 0 | .. | .. | Near Hard Hills, between Redbank and Stuart Mill, St. Arnaud | 14 feet | .. .. | —.12.1870 | .. .. .. | P. Simpson, Mining Surveyor, Report, 1870, p. 35 | |
| 828 | A | 44 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | T. Conolly and party .. | Nugget Book | |
| 829 | A | 44 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 4 feet | .. .. | —.6.1907 | Jackson and Hughes | A. M. Howitt | |
| 830 | A | 43 17 0 | .. | 42 8 0 | Blanket Flat, near Daylesford | Shallow | .. .. | 28.8.1873 | P. Nelson and party | T. Hale, Mining Registrar, Nugget Book | |
| 831 | A | 43 13 12 | .. | .. | Guy's Rush, Rheola, Kangderaar | Very shallow | .. .. | —.3.1885 | .. .. .. | N. J. Maude, Mining Surveyors' Reports, March, 1885, p. 22 | |
| *832 | A | 43 9 18 | 42 18 12 | .. | Kingower .. | 6 inches | .. .. | 23.7.1888 | .. .. .. | Nugget Book | |
| 833 | Q | 43 0 0 | .. | .. | No. 4 Llanberris Mine, Ballaarat | 600 feet | .. .. | About 1.8.1869 | Llanberris Mining Co. | J. W. Gregory, Memoir No. IV., p. 8 | On indicator |
| 834 | A | 43 0 0 | .. | .. | Specimen Gully, Jones' Creek, Waanyarra | 26 feet | .. .. | —.12.1876 | .. .. .. | W. G. Couchman, Mining Surveyors' Reports, December, 1876, p. 32 | |
| 835 | A | 43 0 0 | .. | .. | Forest Creek, Parish of Castlemaine or Chewton | 4 to 8 feet | .. .. | 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 63 | |
| 836 | A | 43 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374, R. Brough Smyth's Gold-fields, &c. | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 837 | A | 43 0 0 | 43 0 0 | .. | Catto's Paddock, Berlin, Kangderaar | 20 feet | .. | .. | 7.4.1870 | .. — .. | T. Richardson, Mining Registrar, Nugget Book | Flat nugget, solid gold |
| 838 | A | 43 0 0 | 43 0 0 | .. | Koh-i-noor Mine, Ballaarat | 360 feet | .. | .. | 19.7.1871 | Koh-i-noor Mining Co. | H. Wood, Mining Registrar, Nugget Book | All gold, and in shape like a child's foot |
| 839 | A | 43 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 840 | A | 42 16 0 | .. | .. | Chiltern Division .. | Shallow | .. | .. | .. | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 194 | |
| 841 | A | 42 15 0 | .. | .. | Near Talbot, Parish of Amherst | .. | .. | .. | —.6.1872 | .. .. .. | Joseph Smith, Mining Registrars' and Surveyors' Reports, June, 1872, p. 36 | |
| 842 | A | 42 11 0 | .. | 36 5 0 | Mount Blackwood.. | .. | .. | .. | 1855 | .. .. .. | W. Birkmyre, p. 370, R. Brough Smyth's Gold-fields, &c. | |
| 843 | A | 42 10 14 | .. | 41 1 7 | Maximilian Creek, Briagolong | 8½ feet | .. | .. | 26.4.1870 | Rasmus Thomson .. | W. Foster, Warden, Nugget Book | Shaped like a flattened pear |
| 844 | A | 42 8 2 | .. | .. | Butterfly Gully, Hepburn | Shallow | .. | .. | —.9.1873 | .. .. .. | T. Hale, Mining Registrars' and Surveyors' Reports, September, 1873, p. 37 | |
| 845 | A | 42 0 0 | .. | .. | Happy Valley, St. Andrews | .. | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 378, R. Brough Smyth's Gold-fields, &c. | |
| 846 | A | 42 0 0 | .. | 40 0 0 | Green Gully, Holcombe | 30 feet | .. | .. | —.9.1869 | Tocknell and party .. | Mark Amos, Mining Surveyor, Nugget Book | Found resting on a soft white sandstone bottom |
| 847 | A | 42 0 0 | .. | .. | Berlin Rush, Kangderaar | 12 feet | .. | .. | 22.5.1869 | Kennedy and party .. | R. Mason, Mining Registrar, Nugget Book | |
| 848 | A | 42 0 0 | .. | .. | Berlin Flat, Kangderaar | 12 feet | .. | .. | Between 24.3.1870 and 20.6.1870 | .. .. .. | F. Knox Orme, Warden, Nugget Book | |
| 849 | A | 42 0 0 | 36 12 0 | .. | Near Tipperary Flat, Blackwood | 8 inches | .. | .. | —.3.1872 | .. .. .. | J. F. Hansen, Mining Registrars' and Surveyors' Reports, March, 1872, p. 24 | Found on hillside |
| 850 | Q | .. | .. | 42 0 0 | Spring Gully Mine, Castlemaine | .. | .. | .. | 30.11.1904 | A party of tributers .. | Nugget Book | |
| 851 | A | 42 0 0 | .. | .. | Peg Leg Gully, Eaglehawk | Shallow | .. | .. | 1852 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 75 | |
| *852 | A | 41 10 0 | .. | .. | Inkerman Sluicing Co., Maryborough | 16 feet | .. | .. | 13.6.1906 | Inkerman Sluicing Co. | Nugget Book .. .. | Found on Chadwick's indicator line |
| *853 | A | 41 8 0 | ... | .. | White Horse Ranges Ballaarat | 50 feet | .. | .. | 25.12.1875 | Roxburgh, Trinfield, and party | D. Christy, Mining Registrar, Nugget Book | |
| 854 | A | 41 0 0 | 25 0 0 | .. | Poseidon Lead, Tarnagulla | 60 feet | .. | .. | 20.4.1907 | Williams and Glover | A. M. Howitt | |
| 855 | A | 41 0 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374, R. Brough Smyth's Gold-fields, &c. | |
| 856 | A | 41 0 0 | .. | 37 14 18 | New Nuggetty Gully, Parish of Campbelltown | 15 feet | .. | .. | 10.2.1902 | W. Huffa and A. Kennett | Nugget Book .. .. | Found close to where three large nuggets were found, the largest weighing 216 ozs. |
| *857 | A | 41 0 0 | .. | .. | Blacks' Camp, Watchem, Mallee Lead | .. | "The Watchem" | | 18.8.1904 | A boy named Frank Colbert | Nugget Book .. .. | Carried there by Aboriginals |
| 858 | A | 41 0 0 | .. | .. | Durham Lead, Buninyong | About 300 feet | .. | .. | —.10.1865 | The Sons of Freedom Mining Co. | Dicker's Mining Record, October, 1865, p. 238 | In nuggets |
| 859 | A | 41 0 0 | 35 11 0 | .. | Poseidon Lead, Tarnagulla | 71 feet | "Euphemia" | .. | 2.10.1907 | Wilkins and Baker .. | A. M. Howitt | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 860 | A | 41 0 0 | 40 10 0 | .. | Blink Bonny Gully, near Freestone Creek, Briagolong | 16½ feet | .. .. | —.1.1870 | J. Thornton .. | W. Foster, Warden, Nugget Book | Associated with quartz and ironstone |
| 861 | A | 40 13 0 | 38 14 12 | .. | Green Hills, near Stawell | 40 feet | .. .. | 13.12.1879 | Carney and party .. | H. Bate, Mining Registrar, Nugget Book | Rather flat |
| *862 | A | 40 13 0 | .. | .. | Tarnagulla .. | .. | .. .. | 9.9.1887 | .. .. .. | Nugget Book | |
| 863 | A | 40 7 0 | 39 0 0 | .. | Tambourine Gully, Wedderburne | 3 feet | .. .. | 4.9.1880 | H. Kropp .. .. | J. Reach, Mining Registrar, Nugget Book | Found in red clay, honeycombed and associated with quartz |
| 864 | A | 40 5 0 | .. | 20 2 0 | Prospectors' Tribute Claim, Foster | 50 feet | .. .. | 8.11.1876 | Prospector's tribute claim | G. R. Murphy, Mining Registrar, Nugget Book | |
| 865 | A | 40 4 3 | 40 4 3 | .. | Tyler's Diggings, Berlin, Kangderaar | 8 feet | .. .. | —.8.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | Pure gold |
| 866 | A | 40 3 12 | .. | 39 10 0 | Hoffnung Claim, Amherst | 70 feet | .. .. | 4.2.1871 | Hoffnung Claim .. | J. Smith, Mining Surveyor, Nugget Book | Oblong in shape |
| 867 | A | 40 2 0 | .. | .. | Griffiths' Gully, Maryborough | 6 feet | .. .. | .. | .. .. .. | A. M. Howitt, Memoir No. XI. .. | Found on line of lamprophyre dyke |
| 868 | A | 40 0 0 | 32 0 0 | .. | Poseidon Lead, Tarnagulla | 25 feet | .. .. | 29.11.1906 | Bravo and party .. | A. M. Howitt, Records, Vol. III., Part I. | Found on the bedrock |
| 869 | A | 40 0 0 | .. | .. | Paddy's Gully, Rokewood Junction | 6 inches | .. .. | —.3.1873 | .. .. .. | J. Coleman, Mining Registrars' and Surveyors' Reports, March, 1873, p. 26 | |
| 870 | A | 40 0 0 | .. | .. | Wattle Flat, Dunolly, near Herbert's orchard | 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter Sheet Map, No. 53D, S.W. | |
| 871 | A | 40 0 0 | .. | .. | Pound Rush, Dunolly | 20 feet | .. .. | 1867 | .. .. .. | W. H. Ferguson's Report | |
| 872 | A | 40 0 0 | .. | .. | Break-of-Day, Rokewood | About 30 feet | .. .. | —.3.1878 | Turner and party .. | George Perry, Mining Surveyors' and Registrars' Reports, March, 1878 | |
| 873 | A | 40 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's Gold-fields, &c. | |
| 874 | A | 40 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's Gold-fields, &c. | |
| 875 | Q | 40 0 0 | .. | 30 0 0 | Speedwell Claim, Staffordshire reef | 60 feet | .. .. | 2.8.1869 | Speedwell Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 876 | A | 40 0 0 | .. | .. | Burnt Creek, Dunolly | Shallow | .. .. | —.12.1908 | Burnt Creek Hydraulic Sluicing Co. | *Age* Newspaper, 7th December, 1908 | |
| 877 | A | 40 0 0 | .. | .. | Gully near Avoca | .. | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 376, R. Brough Smyth's Gold-fields, &c. | |
| 878 | A | 40 0 0 | .. | .. | Catch-me-if-you-can Lead, Dunolly | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter Sheet Map, No. 53D, S.W. | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 879 | A | 40 0 0 | .. | .. | Stockyard Creek, Howqua River | .. | .. | .. | .. | Tomkins .. .. | O. A. L. Whitelaw | | |
| 880 | A | 40 0 0 | .. | .. | Cosmopolitan Mine, Ballaarat | About 400 feet | .. | .. | —.9.1862 | Cosmopolitan Mining Co. | Dicker's Mining Record, September, 1862, p. 9 | | |
| 881 | A | 40 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. | .. | —.12.1865 | .. .. .. | Dicker's Mining Record, December, 1865, p. 388 | | |
| 882 | Q | 40 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 850 feet | .. | .. | —.8.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 14th August, 1909 | On indicator | |
| 883 | A | 40 0 0 | .. | 39 0 0 | Tyler's Rush, Kangderaar | .. | .. | .. | —.9.1869 | .. .. .. | F. Knox Orme, Warden, Nugget Book | Hollowed and honeycombed one side | |
| 884 | Q | 40 0 0 | .. | .. | North Woah Hawp Mine, Ballaarat | 950 feet | .. | .. | —.8.1910 | North Woah Hawp Mining Co. | *Age* Newspaper, 25th August, 1910 | On indicator | |
| 885 | A | 40 0 0 | .. | .. | Berlin Flat, Kangderaar | 19 feet | .. | .. | —.3.1869 | .. .. .. | Dicker's Mining Record, 29th March, 1869 | | |
| 886 | A | 40 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. | .. | About 18.12.1906 | Jackson and party .. | A. M. Howitt, Records, Vol. III., Part I. | Found 4 inches above the bedrock | |
| 887 | A | 40 0 0 | .. | .. | Baker's Gully, near Moliagul Township | Shallow | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | | |
| 888 | A | 40 0 0 | 29 8 0 | .. | Nick-o'-Time Lead, Tarnagulla | 15 feet | .. | .. | 6.10.1903 | Yeo, Hatt, and Bravo | A. M. Howitt, Records, Vol. III., Part I. | Photo. of nugget in Annual Report, 1903 | |
| 889 | A | 40 0 0 | .. | .. | Stuart's Gully, near Maximilian Creek, Lower Gladstone | Surface | .. | .. | About 1870 | .. .. .. | Mining Registrars' and Surveyors' Reports, March 1874, p. 37 | | |
| 890 | A | 39 17 0 | .. | 19 4 0 | No locality given .. | .. | .. | .. | 1854 | .. .. .. | W. Birkmyre, p. 370, R. Brough Smyth's Gold-fields, &c. | | |
| 891 | A | 39 15 0 | .. | 39 0 0 | Chinaman's Flat, Maryborough | Deep | .. | .. | 10.7.1873 | Band of Hope Mining Co., Timor | P. Virtue, jun., Mining Registrar. Nugget Book | Found in sluice box, nearly pure gold | |
| 892 | A | 39 15 0 | 39 15 0 | .. | Berlin Diggings, Kangderaar | 8 to 12 inches | .. | .. | 20.7.1870 | Walter Wright and party | F. Knox Orme, Warden, Nugget Book | All gold | |
| 893 | A | 39 12 0 | .. | 39 11 6 | Berlin Diggings, Kangderaar | 14 feet | .. | .. | 16.9.1870 | .. .. .. | H. J. Hughes, Mining Registrar, Nugget Book | In shape like a crucifix | |
| *894 | A | 39 0 0 | .. | .. | Argyle Lead, Sulky Gully, Ascot | 82 feet | .. | .. | 3.3.1887 | Midas Mining Co. .. | Nugget Book | | |
| 895 | A | 39 0 0 | 34 10 0 | .. | Tambourine Gully, Wedderburne | 2 feet | .. | .. | 13.8.1880 | Robert Willis .. | Progress Report No. VII., p. 125 | | |
| 896 | A | 39 0 0 | .. | .. | Argyle Gully, Heathcote | .. | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 376, R. Brough Smyth's Gold-fields, &c. | | |
| 897 | A | 38 10 0 | 25 0 0 | .. | Burgess' Gully, Whipstick, Bendigo | 2 feet | .. | .. | 23.6.1870 | James Burgess .. | N. G. Stephens, Mining Registrar, Nugget Book | Encased in a weatherworn quartz, slightly ferruginous, and about the size and shape of a man's fist | |
| 898 | A | 38 8 0 | .. | 29 15 0 | Frenchman's Gully, Wedderburne | 8 feet | .. | .. | 21.10.1875 | Thomas McMeikan .. | Progress Reports, No. IV., p. 49 | Rough and ragged | |
| 899 | A | 38 0 0 | 26 10 0 | .. | Poseidon Lead, Tarnagulla | 16 feet | .. | .. | 17.6.1907 | J. Porter (Prospector's Claim) | A. M. Howitt | | |
| 900 | A | 38 0 0 | .. | .. | Berlin Diggings, Kangderaar | 8 to 12 inches | .. | .. | Prior to 31.12.1868 | .. .. .. | Mining Surveyors' Reports, December, 1868, p. 375 | | |
| 901 | A | 38 0 0 | .. | .. | Whipstick, Bendigo | .. | .. | .. | —.2.1869 | .. .. .. | W. G. Stephens, Mining Registrar, Nugget Book | Waterworn | |
| 902 | A | 38 0 0 | .. | .. | Langham Flat, Berlin, Kangderaar | 9 feet | .. | .. | —.12.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | | |
| 903 | A | 38 0 0 | .. | .. | John's Paddock, Berlin, Kangderaar | 9 feet | .. | .. | 7.1.1870 | George Keys .. | F. Knox Orme, Warden, Nugget Book | | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 904 | A | 38 0 0 | 38 0 0 | .. | Berlin Diggings, Kangderaar | 8 to 12 inches | .. .. | 19.7.1870 | Ah Yea and party .. | F. Knox Orme, Warden, Nugget Book | All gold |
| 905 | A | 38 0 0 | .. | .. | Near Rheola, Kangderaar | About 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 906 | A | 38 0 0 | .. | 25 0 0 | Whipstick, Bendigo | .. | .. .. | —.6.1870 | .. .. .. | N. G. Stephens, Mining Registrars' and Surveyors' Reports, June, 1870, p. 32. | Associated with quartz |
| 907 | A | 37 17 0 | 36 0 0 | .. | Poseidon Lead, Tarnagulla | 72 feet | "McKenzie's Luck" | 14.9.1908 | McKenzie and Michael | A. M. Howitt | |
| 908 | A | 37 10 0 | .. | .. | Break - of - Day, Rokewood | 30 feet | .. .. | —.9.1878 | .. .. .. | G. Perry, Mining Registrars' and Surveyors' Reports, September, 1878, p. 24 | |
| *909 | A | 37 0 0 | .. | 35 7 0 | Havelock Lead, Bet Bet | .. | .. .. | 18.7.1911 | Stanley and Phillips .. | Nugget Book | |
| *910 | A | 37 0 0 | .. | .. | Argyle Lead, Sulky Gully, Ascot | 82 feet | .. .. | 3.3.1887 | Midas Mining Co. .. | Nugget Book | |
| 911 | A | 37 0 0 | .. | 35 10 16 | Berlin Diggings, Kangderaar | 8 feet | .. .. | 24.2.1870 | Jamieson Bros. .. | F. K. Orme, Warden, Nugget Book | |
| 912 | A | 37 0 0 | .. | .. | Berlin Diggings, Kangderaar | 8 to 12 inches | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 913 | A | 37 0 0 | .. | .. | Baker's Gully, near Moliagul Township | About 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Dunolly Report | |
| 914 | A | 37 0 0 | 37 0 0 | .. | Berlin Diggings, Kangderaar | 10 inches | .. .. | 6.8.1870 | James Lidster and party | F. K. Orme, Warden, Nugget Book | All gold |
| 915 | A | 37 0 0 | .. | .. | Corinella Extended Mine, Eganstown, Daylesford | About 30 feet | .. .. | 23.5.1896 | Corinella Extended Mining Co. | W. Trenkner, Mining Registrar, Nugget File | |
| 916 | A | 37 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. .. | 13.4.1907 | Harding and party .. | A. M. Howitt | |
| 917 | A | 37 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. .. | 13.4.1907 | .. .. .. | W. H. Ferguson's Report | |
| 918 | A | .. | .. | 36 19 0 | Whipstick, Bendigo | .. | .. .. | 10.9.1879 | J. Henston .. | Progress Report No. VII., p. 125 | Honeycombed and waterworn |
| 919 | A | 36 15 0 | .. | 35 4 0 | Berlin, Kangderaar | Close to surface | .. .. | 25.4.1873 | A party of miners .. | J. Martin, Mining Registrar, Nugget Book | Ragged in appearance |
| 920 | A | 36 12 0 | 36 12 0 | .. | Merrijig Creek, Gippsland | 24 feet | .. .. | 16.6.1887 | .. .. .. | Mining Registrars' and Surveyors' Reports, June, 1887, p. 31 | Pure gold |
| *921 | A | 36 10 0 | .. | .. | Midas Co.'s Mine, Sulky Gully, Ascot | About 114 feet | .. .. | —.10.1887 | Midas Mining Co. .. | Nugget Book | |
| 922 | A | 36 0 0 | .. | .. | Western Lead, Dunolly | .. | .. .. | —.9.1874 | .. .. .. | W. G. Couchman, Mining Registrars' and Surveyors' Reports, September, 1874, p. 34 | |
| 923 | A | 36 0 0 | 18 12 0 | .. | Crusoe Gully, Bendigo | Close to surface | .. .. | 8.1.1876 | Richard Marks .. | Progress Report No. IV., p. 49 .. | Associated with quartz |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 924 | A | 36 0 0 | .. | 34 10 0 | Specimen Gully, Jones' Creek, Waanyarra | 14½ feet | .. .. | 25.3.1875 | J. T. Bragg and E. Robinson | Progress Report No. III., p. 119 | |
| 925 | A | 36 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. .. | 18.3.1869 | .. .. .. | Nugget Book | |
| 926 | A | 36 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| *927 | A | 36 0 0 | 36 0 0 | .. | Turton's Creek, near Foster | Shallow | "The Oldham" | —.4.1873 | Oldham and Furness | W. Oldham, Nugget Book .. | All gold. Flat, and very much waterworn |
| 928 | A | 36 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 30 feet | .. .. | 21.3.1907 | Ryan and Brett .. | A. M. Howitt | |
| 929 | A | .. | 36 0 0 | .. | Long Gully, Tarrengower | Near surface | .. .. | —.1.1862 | .. .. .. | Dicker's Mining Record, January, 1862, p. 3 | |
| 930 | A | .. | .. | 36 0 0 | Nuggetty Gully, Middleton's Creek, about 8 miles south of Fryerstown | 15 feet | .. .. | 1858 | — Woolf .. .. | Mark Amos, Mining Surveyor, Nugget Book | |
| 931 | A | 36 0 0 | .. | .. | Berlin Rush, Kangderaar | 11½ feet | .. .. | —.7.1869 | .. .. .. | F. Knox Orme, Warden, Nugget Book | Flat and waterworn |
| 932 | A | 36 0 0 | .. | .. | Langham Flat, Kangderaar | 9 feet | .. .. | —.12.1874 | .. .. .. | Mining Registrars' and Surveyors' Reports, December, 1874, p. 34 | |
| 933 | Q | 36 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 750 feet | .. .. | —.5.1910 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 6th May, 1910 .. | On indicator |
| 934 | A | 36 0 0 | .. | .. | Poseidon Lead, Tarnagulla | Shallow | .. .. | 16.2.1907 | Carling and party .. | Nugget Book .. .. | Found between Jackson and Gascoigne's Claims |
| 935 | A | 36 0 0 | .. | .. | Wattle Flat, Dunolly | 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 936 | A | 36 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 937 | A | 36 0 0 | .. | .. | Old Lead, Dunolly | 20 to 60 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 938 | A | 36 0 0 | .. | .. | Pott's Gully, near Wattle Flat, Dunolly | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 939 | A | 36 0 0 | .. | .. | Pott's Gully, near Wattle Flat, Dunolly | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 940 | A | 36 0 0 | .. | .. | Near Black Reef, Moliagul | Surface | .. .. | .. | .. .. .. | J. Stirling, Monthly Progress Report, No. III., June, 1899, p. 21 | Close to "Welcome Stranger" |
| 941 | A | 35 15 0 | .. | 22 0 0 | Whipstick, Bendigo | 8 to 10 feet | .. .. | 31.7.1869 | .. .. .. | N. G. Stephens, Mining Registrar, Nugget Book | Associated with quartz and ironstone |
| 942 | A | 35 10 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. .. | —.6.1866 | .. .. .. | Dicker's Mining Record, June, 1866, p. 425 | |
| 943 | A | 35 1 3 | .. | .. | Break-of-Day Mine, Rokewood | 10 to 15 feet | .. .. | 28.4.1866 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 944 | A | 35 0 0 | 35 0 0 | .. | Berlin, Kangderaar | 2 to 18 inches | .. .. | 16.9.1870 | .. .. .. | H. J. Hughes, Mining Registrar, Nugget Book | All gold |
| *945 | A | 35 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 80 feet | .. .. | 18.10.1910 | Dividend Syndicate .. | A. M. Howitt | |
| 946 | A | 35 0 0 | .. | .. | Poseidon Lead, Tarnagulla | .. | .. .. | 13.4.1907 | Cross and Forbes .. | A. M. Howitt | |
| 947 | A | 35 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 72 feet | .. .. | 8.4.1907 | McKenzie's Party .. | A. M. Howitt | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 948 | A | 35 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. .. | —.6.1907 | Jackson and Hughes | A. M. Howitt | |
| 949 | A | 35 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. .. | 19.3.1907 | Jackson and Hughes | A. M. Howitt | |
| 950 | A | 35 0 0 | .. | .. | Gipsy Diggings, Dunolly | 20 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 951 | A | 35 0 0 | .. | 31 0 0 | Haddon South, Smythesdale | 6 inches | .. .. | 7.10.1903 | W. Walsh and W. Willis | Nugget Book .. .. | Found in red clay |
| 952 | A | 35 0 0 | .. | .. | Hard Hill, Dunolly | 16 feet | .. .. | 1857 | .. .. .. | F. K. Orme, p. 372 R. B. Smyth's Gold-fields, &c. | |
| 953 | A | 35 0 0 | .. | .. | Gooseberry Flat, Dunolly | 50 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 954 | A | 35 0 0 | .. | .. | Gooseberry Hill, Dunolly | 50 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373 R. B. Smyth's Gold-fields, &c. | |
| 955 | A | 35 0 0 | .. | 34 0 0 | Green Gully, 8 miles south of Fryerstown, Holcombe | 30 feet | .. .. | —.9.1869 | William Lilford, sen. | Mark Amos, Mining Surveyor, Nugget Book | Found on a soft white sandstone bottom |
| 956 | A | 34 17 12 | .. | 34 0 0 | Hoffnung Claim, Talbot, Parish of Amherst | 70 feet | .. .. | 4.2.1871 | Hoffnung Mining Co... | J. Smith, Mining Surveyor, Nugget Book | A triangular-shaped nugget |
| 957 | A | 34 13 0 | .. | .. | Whiskey Gully, Caledonia, Warrandyte | 11 feet | .. .. | 26.4.1869 | Charles Hirt, jun. .. | A. Armstrong, Mining Registrar, Nugget Book | In shape like a cucumber |
| 958 | A | 34 10 0 | .. | .. | Jones' Creek, Specimen Gully, Waanyarra | Shallow | .. .. | —.3.1875 | .. .. .. | Mining Registrars' and Surveyors' Reports, March, 1875, p. 34 | |
| 959 | A | 34 7 0 | 33 2 0 | .. | Robinson Crusoe Gully, Alexandra | 112 feet | .. .. | 29.9.1870 | Finn and party .. | R. A. F. Murray, Mining Surveyor, Nugget Book | Almost pure gold. Much waterworn |
| 960 | A | 34 3 0 | 31 9 1 | .. | Hoffnung Claim, Talbot, Parish of Amherst | 90 feet | .. .. | 16.1.1882 | Hoffnung Mining Co. | Nugget Book .. .. | Found amongst fossil fruit and wood, in wash |
| 961 | A | 34 0 0 | .. | .. | Nick-of-Time Lead, Tarnagulla | .. | .. .. | .. | Smith and party .. | A. M. Howitt, Records, Vol. III., Part I. | |
| 962 | A | 34 0 0 | .. | .. | Clodhopper Gully, Dunolly | 5 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. B. Smyth's Gold-fields, &c. | Found in gravelly clay with ironstone boulders |
| 963 | A | 34 0 0 | .. | .. | Break-of-Day, Rokewood | 10 to 15 feet | .. .. | 29.8.1866 | Break-of-Day Mining Co. | J. F. Coleman, Mining Registrar, Nugget Book | |
| 964 | A | 34 0 0 | .. | .. | Spark's Gully, Moliagul | .. | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. B. Smyth's Gold-fields, &c. | |
| 965 | A | 34 0 0 | .. | .. | Berlin Rush, Kangderaar | 12 feet | .. .. | —.8.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 966 | A | 34 0 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. B. Smyth's Gold-fields, &c, | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 967 | A | 34 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373, R. B. Smyth's Gold-fields, &c. | In coarse drift |
| 968 | A | 34 0 0 | .. | .. | Great Extended Mine, Ballaarat | About 400 feet | .. | .. | —.3.1863 | Great Extended Mining Co. | Dicker's Mining Record, March, 1863, p. 85 | |
| 969 | A | 34 0 0 | .. | .. | Township of Wedderburne | .. | .. | .. | .. | .. .. .. | O. A. L. Whitelaw's Quarter Sheet Map, No. 63D, S.W. | |
| 970 | A | 34 0 0 | 28 0 0 | .. | Poseidon Lead, Tarnagulla | 67 feet | .. | .. | 7.10.1907 | Yates and party .. | A. M. Howitt.. .. .. | Coated with black oxide of manganese |
| *971 | A | 34 0 0 | .. | 30 1 0 | Red Streak, Creswick | 180 feet | .. | .. | 31.8.1872 | Key Mining Co. .. | James Stevenson, Mining Registrar, Nugget Book | |
| 972 | A | 33 16 0 | .. | .. | Great Gulf Mine, Ballaarat | Deep | .. | .. | —.7.1867 | Great Gulf Mining Co. | Dicker's Mining Record, July, 1867, p. 36 | |
| 973 | A | 33 10 0 | .. | .. | Neighbourhood of Dunolly | .. | .. | .. | Prior to 21.10.1868 | .. .. .. | F. K. Orme, p. 374, R. B. Smyth's Gold-fields, &c. | |
| 974 | A | 33 10 0 | .. | .. | Star of Loddon, Nick - of - Time, Newbridge, Tarnagulla | 100 feet | .. | .. | About 1905 | Star of Loddon Claim | A. M. Howitt, Records, Vol. III., Part 1. | |
| 975 | A | 33 4 0 | .. | 33 0 0 | Wedderburne .. | 7 feet | .. | .. | 5.9.1884 | William Hill .. | Nugget Book | |
| 976 | A | 33 2 0 | .. | .. | Robinson Crusoe Gully, Alexandra | 112 feet | .. | .. | —.9.1870 | Finn and party .. | Nugget Book | |
| 977 | A | 33 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 13 feet | .. | .. | About 18.12.1906 | Cox and Newitt .. | A. M. Howitt, Records, Vol. III., Part 1. | |
| 978 | A | 33 0 0 | .. | .. | Berlin Diggings, Kingower | Shallow | .. | .. | 20.6.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 979 | A | 33 0 0 | .. | .. | Bigg's Gully, Moliagul | Surface | .. | .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. B. Smyth's Gold-fields, &c. | Found in red clay |
| 980 | A | 33 0 0 | .. | .. | Gooseberry Hill, Dunolly | 50 feet | .. | .. | 1866 | .. .. .. | F. K. Orme, p. 373, R. B. Smyth's Gold-fields, &c. | |
| 981 | A | 33 0 0 | .. | .. | Break - of - Day, Rokewood | .. | .. | .. | —.9.1866 | Break-of-Day Mining Co. | Dicker's Mining Record, September, 1866, p. 167 | |
| 982 | A | 33 0 0 | .. | .. | Berlin Diggings, Kingower | Shallow | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. B. Smyth's Gold-fields, &c. | |
| 983 | A | 33 0 0 | .. | .. | Sporting Flat, Dunolly | .. | .. | .. | —.9.1871 | .. .. .. | Mining Registrars' and Surveyors' Reports, September, 1871. p. 32 | |
| 984 | A | 33 0 0 | .. | .. | Victoria Gully, Taradale | .. | .. | .. | Prior to 1869 | .. .. .. | Mining Surveyors' Reports, p. 377. R. B. Smyth's Gold-fields, &c. | In gravel, on sandstone bottom |
| 985 | A | 33 0 0 | .. | .. | Nick-of-Time Lead, Newbridge, Tarnagulla | 10 feet | .. | .. | About 1903 | Yeo, Hatt, and Bravo | A. M. Howitt, Records, Vol. III., Part I. | |
| 986 | A | 33 0 0 | .. | .. | Argyle Gully, Heathcote | .. | .. | .. | Prior to 1869 | .. .. .. | Mining Surveyors' Reports, p. 376. R. B. Smyth's Gold-fields, &c. | |
| *987 | A | 32 11 0 | 32 10 12 | .. | Carisbrook Consols Mine, Carisbrook | 65 feet | .. | .. | 13.11.1878 | Carisbrook Mining Co. | Peter Virtue, Mining Registrar, Nugget Book | 30 to 40 ozs. of nuggetty gold mixed with cement were obtained with this nugget |
| 988 | Q | 32 10 0 | .. | .. | Dreadnought Claim, Homebush | 8 feet | .. | .. | —.7.1909 | Stratman and party | A. M. Howitt, Records, Vol. III., Part 2 | On the Dreadnought Indicator |
| 989 | A | 32 7 16 | .. | .. | Waterloo Mine, Buninyong | 215 feet | .. | .. | —.6.1864 | Waterloo Mining Co. | Dicker's Mining Record, June, 1864, p. 102 | In several nuggets, individual weights not known |
| 990 | A | .. | .. | 32 7 0 | Jones' Creek, Specimen Point, Tarnagulla | 13 feet | .. | .. | 22.12.1875 | Edward Robinson and Chas. Methven | W. G. Couchman, Mining Registrar, Nugget Book | |
| 991 | A | 32 5 0 | .. | 31 15 0 | Near Middleton Creek, Sebastopol | 8 feet | .. | .. | 5.2.1875 | T. Jones, sen. .. | Mark Amos, Mining Registrar. Nugget Book | |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 992 | A | 32 2 0 | 32 1 0 | .. | Welshman's Point, Wedderburne | 8 feet | .. .. | 4.8.1890 | Antonio Petrovitz .. | Nugget Book .. .. | Close to 336-oz. nugget found at O'possum Point. Pure gold |
| 993 | A | 32 0 0 | .. | .. | Bigg's Gully, Jones' Reef, Moliagul | 15 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. Brough Smyth's, &c. | In gravelly clay, pipeclay bottom |
| 994 | A | 32 0 0 | .. | .. | Tyler's Rush, Berlin, Kangderaar | About 9 feet | .. .. | 12.1.1870 to 24.3.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 995 | A | 32 0 0 | .. | .. | Back Creek Diggings, Talbot, Amherst | About 35 feet | .. .. | —.3.1859 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 199 | |
| 996 | A | 32 0 0 | .. | .. | Mosquito Gully, Dunolly | 14 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. Brough Smyth's, &c. | In coarse drift |
| 997 | A | 32 0 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | .. .. | 20.6.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| *998 | A | .. | .. | 32 0 0 | Key Co., Creswick | .. | .. .. | —.1.1871 | Key Mining Co., Creswick | J. Stevenson, Mining Surveyor, Nugget Book | Much waterworn and honeycombed, the cavities being filled with quartz gravel |
| 999 | A | 32 0 0 | .. | .. | Gooseberry Hill, Dunolly | 50 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373, R. Brough Smyth's, &c. | |
| *1000 | A | 32 0 0 | .. | .. | Midas Co., Sulky Gully, Dowling Forest, Ascot | 114 feet | .. .. | 8.8.1887 | Midas Mining Co. .. | Nugget Book | |
| 1001 | A | 32 0 0 | .. | .. | Moliagul .. .. | Shallow | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373, R. Brough Smyth's, &c. | |
| *1002 | A | 32 0 0 | .. | .. | Midas Co., Sulky Gully, Dowling Forest, Ascot | 114 feet | .. .. | 11.4.1888 | Midas Mining Co. .. | Nugget Book | |
| 1003 | A | 32 0 0 | .. | 25 0 0 | Haddon South, Smythesdale | 6 inches | .. .. | 1.10.1903 | W. Willis and W. Walsh | Nugget Book .. .. | Found in red clay |
| 1004 | A | 32 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 83 feet | .. .. | 1.3.1909 | Junction Claim .. | A. M. Howitt | |
| 1005 | A | 32 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. .. | 18.12.1906 | Jackson and party .. | A. M. Howitt, Records, Vol. III., Part I. | Found 4 inches above bedrock |
| 1006 | A | 32 0 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | |
| 1007 | A | 32 0 0 | .. | .. | Positano Claim, Poseidon Lead, Tarnagulla | 72 feet | .. .. | 31.8.1910 | Dickenson, Kelsall, and party | Nugget Book | |
| 1008 | A | 32 0 0 | .. | .. | Poseidon Lead, Tarnagulla | .. | .. .. | 30.8.1909 | T. Moore .. .. | A. M. Howitt .. .. .. | On western fall of Wool bed Reef near where large nuggets were found 1906–1907 |
| 1009 | A | 32 0 0 | .. | .. | Gipsy Diggings, Dunolly | Under 20 feet | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1010 | A | 32 0 0 | .. | .. | Koh-i-noor Mine, Ballaarat | .. | .. | .. | —.5.1862 | Koh-i-noor Mining Co. | Dicker's Mining Record, May, 1862, p. 10 | |
| 1011 | A | 32 0 0 | .. | .. | Koh-i-noor Mine, Ballaarat | .. | .. | .. | —.7.1863 | Koh-i-noor Mining Co. | Dicker's Mining Record, July, 1863, p. 165 | |
| 1012 | A | 32 0 0 | .. | .. | Stoney Rises Diggings, 3 miles from Borhoney-ghurk R.S. | Shallow | .. | .. | —.10.1863 | .. .. .. | Dicker's Mining Record, October, 1863, p. 221 | |
| 1013 | A | 32 0 0 | .. | .. | Nick-of-Time Lead, Tarnagulla | Shallow | .. | .. | About 1903 | Conolly and party .. | A. M. Howitt, Records, Vol. III., Part 1. | |
| 1014 | A | 32 0 0 | .. | .. | Near Glasgow Hill, Wedderburne | .. | .. | .. | .. | .. .. .. | O. A. L. Whitelaw, Quarter Sheet Map No. 63D, S.W. | |
| 1015 | A | 32 0 0 | .. | .. | Township of Wedderburne | .. | .. | .. | .. | .. .. .. | O. A. L. Whitelaw, Quarter Sheet Map No. 63D, S.W. | |
| 1016 | A | 32 0 0 | .. | .. | Near Fraser's Gully, Dunolly | Shallow | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 1017 | A | 32 0 0 | .. | 31 10 0 | Dead Horse Gully, Maryborough | 6 feet | .. | .. | 28.8.1873 | W. Passobi and party | P. Virtue, jun., Mining Registrar, Nugget Book | |
| 1018 | A | 32 0 0 | .. | .. | Wattle Flat, Dunolly | 10 to 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 1019 | A | 31 15 0 | 30 15 0 | .. | Poseidon Lead, Tarnagulla | 67 feet | .. | .. | 25.5.1908 | Kellam and party .. | A. M. Howitt .. .. .. | With cement |
| 1020 | A | 31 5 0 | .. | 30 15 0 | Golden Reef Mine, Ballaarat | 200 feet | .. | .. | 22.9.1874 | Golden Reef Mining Co. | H. Marquand, Mine Manager, Nugget Book | Waterworn |
| *1021 | A | 31 5 0 | .. | .. | United Leads Mine, Newbridge, Tarnagulla | 64 feet | .. | .. | 16.12.1904 | The United Leads Mining Co. | A. M. Howitt, and Nugget Book | |
| 1022 | A | 31 0 0 | .. | .. | Berlin Diggings, Kangderaar | Shallow | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | |
| 1023 | A | 31 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | |
| 1024 | A | 31 0 0 | .. | .. | Red Streak Lead, Parish of Dunolly | 40 feet | .. | .. | —.6.1879 | .. .. .. | Progress Reports, Nos. VI. and VII., June, 1879, p. 35 | |
| 1025 | A | 31 0 0 | .. | .. | Old Lead, Dunolly District | 10 to 60 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373, R. Brough Smyth's, &c. | |
| 1026 | A | 31 0 0 | .. | .. | Old Lead, Dunolly District | On surface | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373, R. Brough Smyth's, &c. | |
| 1027 | A | 31 0 0 | .. | .. | Nuggetty Hill, Dunolly District | 10 feet | .. | .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. Brough Smyth's, &c. | In coarse drift with sandstone boulders |
| 1028 | A | 31 0 0 | .. | .. | Nuggetty Gully, Old Lead, Dunolly | Surface | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 372, R. Brough Smyth's, &c. | In red clay |
| 1029 | A | 31 0 0 | .. | .. | Cosmopolitan Mine, Ballaarat | .. | .. | .. | —.9.1862 | Cosmopolitan Mining Co. | Dicker's Mining Record, September, 1862, p. 9 | |
| 1030 | A | 31 0 0 | 31 0 0 | .. | Red Streak Rush, Dunolly | 40 feet | .. | .. | —.5.1879 | .. .. .. | W. G. Couchman, Mining Registrar, Nugget Book | Pure gold |
| 1031 | A | 30 18 0 | .. | .. | Havelock Mine, Smythesdale | .. | .. | .. | —.12.1865 | Havelock Mining Co. | Dicker's Mining Record, December, 1865, p. 399 | |
| 1032 | A | 30 15 0 | 30 15 0 | .. | Kitty's Lead, Buninyong | 3 inches | .. | .. | 16.12.1870 | McPherson and party | S. D. S. Huyghue, Warden's Clerk, Nugget Book | Found in red clay. Pure gold |
| 1033 | A | 30 15 0 | .. | .. | Between Guildford and Vaughan, Castlemaine | Shallow | .. | .. | —.6.1867 | .. .. .. | Dicker's Mining Record, June, 1867, p. 265 | |
| 1034 | A | 30 12 0 | .. | .. | Berlin Diggings, Kangderaar | 2 to 18 inches | .. | .. | 16.9.1870 | .. .. .. | H. J. Hughes, Mining Registrar, Nugget Book | Irregular shape, and almost pure gold |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1035 | A | 30 12 0 | .. | .. | Near Amherst Pound, Amherst | .. | .. .. | Prior to 1869 | .. .. .. | Mining Surveyors' Reports, p. 377, R. Brough Smyth's, &c. | |
| 1036 | A | 30 10 0 | 30 10 0 | .. | Berlin Diggings, Kangderaar | 8 to 12 inches | .. .. | 20.7.1870 | Ah Ji and party .. | F. Knox Orme, Warden, Nugget Book | All gold |
| 1037 | A | 30 3 18 | .. | .. | Old Ned's Gully, Rushworth | .. | .. .. | .. | .. .. .. | Norman Taylor, Mining Registrars' Reports, March, 1886, p. 92 | |
| 1038 | Q | 30 1 0 | .. | .. | Union Hill, Creswick | Near Surface | .. .. | —.10.1868 | .. .. .. | Dicker's Mining Record, October, 1868, p. 83 | In quartz reef |
| *1039 | A | 30 1 0 | .. | 29 5 0 | Band - of - Hope, Chinaman's Flat, Maryborough | 230 feet | "The Virtue" .. | 11.3.1871 | Band of Hope Mining Co. | P. Virtue, Mining Registrar, Nugget Book | Found with other flat thin pieces |
| 1040 | A | 30 0 0 | .. | .. | Schicer Gully, Maryborough | About 20 feet | .. .. | .. | .. .. .. | A. M. Howitt, Memoir No. XI. | |
| 1041 | A | 30 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 80 feet | .. .. | 3.6.1910 | Dividend Syndicate .. | A. M. Howitt | |
| 1042 | A | 30 0 0 | .. | .. | Berlin Diggings, Kangderaar | 11 feet | .. .. | 16.9.1870 | .. .. .. | H. J. Hughes, Mining Registrar, Nugget Book | |
| 1043 | A | 30 0 0 | 25 0 0 | .. | Poseidon Lead, Tarnagulla | 68 feet | .. .. | 21.9.1908 | Hockey, Roach, and party | A. M. Howitt | |
| 1044 | A | 30 0 0 | .. | .. | Bigg's Gully, Moliagul | 15 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. Brough Smyth's, &c. | In gravelly clay, pipeclay bottom |
| 1045 | A | 30 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. .. | —.12.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1046 | A | 30 0 0 | .. | .. | Gooseberry Hill, Dunolly | 50 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373, R. Brough Smyth's, &c. | |
| 1047 | Q | 30 0 0 | .. | .. | Victoria United Mine, Ballaarat | .. | .. .. | .. | Victoria United Mining Co. | J. W. Gregory, Memoir No. IV., p. 23 | On indicator (Duchess slates) |
| 1048 | A | 30 0 0 | .. | .. | Burnt Creek Lead, Dunolly | .. | .. .. | —.6.1872 | .. .. .. | Mining Registrars' and Surveyors' Reports, June, 1872, p. 30 | |
| 1049 | A | 30 0 0 | .. | 28 0 0 | Upper Sheepwash, Mandurang | 4 feet | .. .. | —.9.1869 | .. .. .. | N. G. Stephens, Mining Registrar, Nugget Book | Found on pipeclay bottom |
| 1050 | A | 30 0 0 | 24 0 0 | .. | Poseidon Lead, Tarnagulla | 13 feet | .. .. | 10.6.1907 | Cox and Newit .. | A. M. Howitt | |
| 1051 | A | 30 0 0 | .. | .. | Dreadnought Claim, Homebush | Surface | .. .. | —.7.1909 | Stratman and party | A. M. Howitt, Records, Vol. III., Part 2 | On the line of the Dreadnought indicator |
| 1052 | A | 30 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. .. | 1867 | .. .. .. | W. H. Ferguson | |
| 1053 | Q | 30 0 0 | .. | .. | North Woah Hawp, Ballaarat | 840 feet | .. .. | —.2.1910 | North Woah Hawp Mining Co. | The *Age* Newspaper, 19th February, 1910 | On indicator |
| 1054 | A | 30 0 0 | .. | .. | Back Creek Diggings, Talbot, Amherst | About 35 feet | .. .. | —.3.1859 | .. .. .. | W. E. Adcock, The Gold Rushes of the Fifties, p. 199 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1055 | A | 30 0 0 | .. | .. | Western or White Lead, Dunolly | Under 20 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1056 | A | 30 0 0 | .. | .. | Catch-me-if-you-can Lead, Dunolly | Under 20 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1057 | A | 30 0 0 | .. | .. | Catch-me-if-you-can Lead, Dunolly | Under 20 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1058 | A | 30 0 0 | .. | .. | Catch-me-if-you-can Lead, Dunolly | Under 20 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1059 | A | 30 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. | .. | Prior to 31.12.1868 | .. | .. | .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | | |
| 1060 | A | 30 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. | .. | Prior to 31.12.1868 | .. | .. | .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | | |
| 1061 | A | 30 0 0 | .. | .. | Hatter's Gully, Dunolly | Shallow | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1062 | A | 30 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1063 | A | 30 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1064 | A | 30 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1065 | A | 30 0 0 | .. | .. | Gipsy Diggings, Dunolly District | Under 20 feet | .. | .. | Prior to 31.12.1868 | .. | .. | .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | | |
| 1066 | A | 30 0 0 | .. | .. | Gipsy Diggings, Dunolly District | Under 20 feet | .. | .. | Prior to 31.12.1868 | .. | .. | .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | | |
| 1067 | A | 30 0 0 | .. | .. | Gipsy Diggings, Dunolly District | Under 20 feet | .. | .. | Prior to 31.12.1868 | .. | .. | .. | F. K. Orme, p. 375, R. Brough Smyth's, &c. | | |
| 1068 | A | 30 0 0 | .. | .. | In Raglan Mining Division | .. | .. | .. | —.9.1869 | .. | .. | .. | James Daly, Warden, Nugget Book | | |
| 1069 | A | 30 0 0 | .. | .. | Poseidon Lead, Tarnagulla | .. | .. | .. | —.5.1912 | Mrs. Rowlands | .. | | *Age* Newspaper, 22nd May, 1912 | Found on a mullock heap | |
| 1070 | A | 30 0 0 | .. | .. | Clough's Garden, Madman's Gully, Maryborough | 15 feet | .. | .. | .. | J. Clough | .. | .. | J. Clough, Maryborough | | |
| 1071 | A | 30 0 0 | .. | .. | Clover's Gully, Dunolly | Shallow | .. | .. | —.2.1863 | Mr. Clover (the prospector) | | | Dicker's Mining Record, February, 1863, p. 62 | A lump as flat as a pancake | |
| 1072 | A | 30 0 0 | .. | .. | Township of Kingower | .. | .. | .. | —.12.1863 | .. | .. | .. | Dicker's Mining Record, December, 1863, p. 270 | Found near the "Blanche Barkly" | |
| 1073 | A | 30 0 0 | .. | .. | Emu Diggings, Amherst | .. | .. | .. | —.6.1865 | Found by Aborigines | | | Dicker's Mining Record, June, 1865, p. 342 | | |
| 1074 | A | 30 0 0 | .. | .. | Alexandra Mine, Ballaarat | .. | .. | .. | —.4.1866 | Alexandra Mining Co. | | | Dicker's Mining Record, April, 1866, p. 283 | | |
| 1075 | A | 30 0 0 | .. | .. | Lady Don Mine, Ballaarat | .. | .. | .. | —.4.1867 | Lady Don Mining Co. | | | Dicker's Mining Record, April, 1867, p. 182 | | |
| 1076 | A | 30 0 0 | .. | .. | Langham Flat, Kangderaar | .. | .. | .. | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | | |
| 1077 | A | 30 0 0 | .. | .. | Clay Gully, McIntyre's, Moliagul | .. | .. | .. | .. | .. | .. | .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | | |
| 1078 | A | 30 0 0 | .. | 25 0 0 | Fryer's Creek, Fryers | 16 feet | .. | .. | 1854 | George Williams | .. | | Progress Report No. III., p. 118 | In shape like a finger | |
| 1079 | A | 30 0 0 | 25 0 0 | .. | Rogers' Gully, Dunolly | Very shallow | .. | .. | .. | .. | .. | .. | W. H. Ferguson | | |
| 1080 | A | 30 0 0 | .. | .. | Christmas Flat, near Hard Hills, Dunolly | Under 20 feet | .. | .. | —.12.1881 | .. | .. | .. | W. H. Ferguson | | |
| 1081 | A | 30 0 0 | .. | .. | Hard Hills, between McIntyre's and Berlin | .. | .. | .. | —.9.1875 | .. | .. | .. | G. W. Moore, Mining Surveyors' Reports, September, 1875, p. 31 | | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. | | | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross. | Net. | Estimated. | | | | | | | |
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1082 | Q | 30 0 0 | .. | .. | Prince Regent Mine, Ballaarat | .. | .. .. | .. | Prince Regent Mining Co. | J. W. Gregory, Memoir, No. IV., p. 8 | On indicator |
| 1083 | A | 29 3 0 | .. | .. | Gooseberry Hill, Dunolly | 1 foot | .. .. | 4.8.1905 | William Dodd .. | W. H. Ferguson | |
| *1084 | A | 29 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 9 feet | "The Lancaster" | 1.2.1907 | Jackson and party .. | Records, Vol. III., Part 1 .. | On the bedrock |
| 1085 | A | 29 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's Gold-fields, &c. | |
| 1086 | A | 29 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's Gold-fields, &c. | |
| 1087 | A | 29 0 0 | 29 0 0 | .. | Upper Boggy Creek, Bullumwaal | 4 feet | .. .. | 9.9.1873 | R. Taite .. .. | G. Allan, Mining Registrar, and A. W. Howitt, Warden, Nugget Book | Pure gold |
| 1088 | A | 29 0 0 | .. | .. | Billy the Drummer Flat, Hepburn | .. | .. .. | Prior to 1868 | .. .. .. | Mining Surveyors' Reports, p. 378, R. Brough Smyth's Gold-fields, &c. | |
| 1089 | A | 29 0 0 | .. | .. | Nuggetty Gully, Amherst | .. | .. .. | —.7.1868 | .. .. .. | Dicker's Mining Record, July, 1868, p. 10 | |
| 1090 | A | 29 0 0 | .. | 27 0 0 | Dunolly .. .. | 42 feet | .. .. | 29.10.1880 | T. Costello and another | W. G. Couchman, Mining Registrar, Nugget Book | Dark spongy gold, irregular in shape |
| 1091 | A | 29 0 0 | .. | .. | Hard Hills, Dunolly | .. | .. .. | —.12.1881 | P. Secor .. .. | Mining Registrars' and Surveyors' Reports, December, 1881, p. 37 | |
| 1092 | A | 29 0 0 | .. | .. | Break-of-Day, Rokewood | .. | .. .. | —.6.1879 | Break-of-Day Mining Co. | Geo. Perry, Mining Surveyors' Reports, June, 1879, p. 24 | |
| 1093 | A | 29 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | E. Williamson .. | Nugget Book | |
| *1094 | A | 29 0 0 | .. | .. | Nick-of-Time Lead, Newbridge, Tarnagulla | 10 feet | .. .. | 14.10.1903 | Yeo, Hatt, and Bravo | Nugget Book | |
| 1095 | A | 29 0 0 | 22 0 0 | .. | Poseidon Lead, Tarnagulla | 58 feet | .. .. | 26.8.1907 | Cullen and Yates .. | A. M. Howitt | |
| 1096 | A | 28 19 12 | 25 0 0 | .. | Eames' Gully, ¼ mile West of Flagstaff Reef, Bendigo | 3 feet | .. .. | 28.9.1876 | Samuel Nicholas .. | N. G. Stephens, Mining Registrar, Nugget Book | Flat nugget |
| 1097 | A | 28 16 0 | .. | 27 10 0 | Seaham Mine, Maryborough | 70 feet | .. .. | 1.3.1872 | Seaham Mining Co. .. | P. Virtue, jun., Mining Registrar, Nugget Book | Honeycombed |
| 1098 | Q | 28 15 12 | .. | 11 4 0 | Tarrengower .. | .. | .. .. | 1860 | .. .. .. | W. Birkmyre, p. 370, R. Brough Smyth's Gold-fields, &c. | |
| 1099 | A | 28 15 0 | .. | .. | Big River District | .. | .. .. | —.12.1869 | A Chinaman .. | Mining Registrars' and Surveyors' Reports, December, 1869, p. 28 | |
| 1100 | A | 28 14 12 | .. | 27 14 12 | Freestone Creek, Upper Gladstone | 2½ feet | .. .. | 4.3.1871 | J. H. Pope and party | W. Foster, Warden, Nugget Book | Very flat, and in shape like a tobacco pipe |
| 1101 | A | 28 11 0 | .. | 17 12 0 | Cobbler's Gully, Warrandyte | 6 feet | .. .. | 28.12.1874 | James Goodson .. | Progress Report No. III., p. 118 | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1102 | A | 28 10 0 | .. | .. | Dunolly District .. | .. | .. | .. | —.5.1866 | .. .. .. | Dicker's Mining Record, May, 1866, p. 340 | |
| 1103 | A | 28 10 0 | .. | .. | Berlin Rush, Kangderaar | 11 feet | .. | .. | —.9.1869 | .. .. .. | F. Knox Orme, Warden, Nugget Book | Ragged |
| 1104 | A | 28 8 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | —.12.1881 | Fielder and McDonald | Mining Registrars' and Surveyors' Reports, December, 1881, p. 37 | |
| 1105 | A | 28 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 71 feet | .. | .. | 3.5.1909 | Burbank, Brett, and party | A. M. Howitt | |
| 1106 | A | 28 0 0 | .. | .. | Specimen Gully, Jones' Creek, Waanyarra | 26 feet | .. | .. | —.3.1875 | .. .. .. | Mining Registrars' and Surveyors' Reports, March, 1875, p. 33 | |
| 1107 | A | 28 0 0 | .. | .. | Sporting Flat, Dunolly | Under 20 feet | .. | .. | —.3.1873 | .. .. .. | Mining Registrars' and Surveyors' Reports, March, 1873, p. 35 | |
| 1108 | A | 28 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375, R. Brough Smyth's Gold-fields, &c. | |
| 1109 | A | 28 0 0 | 28 0 0 | .. | Catto's Paddock, Berlin, Kangderaar | 20 feet | .. | .. | 7.4.1870 | .. .. .. | T. Richardson, Mining Registrar, Nugget Book | Flat and solid. Pure gold |
| 1110 | A | 28 0 0 | .. | .. | Fryer's Creek, Big River, Kevington | .. | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 376, R. B. Smyth's, &c. | |
| 1111 | A | 28 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. | .. | Between 24.3.1870 and 20.6.1870 | .. .. .. | F. Knox Orme, Warden, Nugget Book | |
| 1112 | A | 28 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. | .. | Between 24.3.1870 and 20.6.1870 | .. .. .. | F. Knox Orme, Warden, Nugget Book | |
| 1113 | A | 28 0 0 | .. | .. | Keep-it-dark Gully, Hepburn | 10 feet | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 378, R. Brough Smyth's Gold-fields, &c. | |
| 1114 | A | 28 0 0 | .. | .. | Berlin Diggings, Kangderaar | 12 feet | .. | .. | 19.9.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1115 | A | 28 0 0 | .. | .. | Spark's Gully, Moliagul | 12 feet | .. | .. | 1859 | .. .. .. | F. K. Orme, p. 372, R. Brough Smyth's Gold-fields, &c. | In gravelly clay, with sandstone boulders |
| 1116 | A | 28 0 0 | .. | .. | Waterloo Mine, Buninyong | 215 feet | .. | .. | —.6.1864 | Waterloo Mining Co. | Dicker's Mining Record, June, 1864, p. 102 | |
| 1117 | A | 28 0 0 | .. | .. | Nuggetty Gully, Talbot | Shallow | .. | .. | —.7.1868 | .. .. .. | Dicker's Mining Record, July, 1868, p. 10 | |
| 1118 | A | 28 0 0 | .. | .. | Whipstick Rush, Sydney Flat, Bendigo | 4 feet | .. | .. | —.7.1868 | .. .. .. | Dicker's Mining Record, July, 1868, pp. 34 and 35 | |
| 1119 | A | 28 0 0 | .. | .. | Reach's Claim, Potter's Hill, Wedderburne | 2 feet | .. | .. | .. | Reach and party .. | E. J. Dunn, Quarterly Report, December, 1888, p. 67 | 170 ounces, mostly in nuggets was obtained from this 10 feet x 10 feet claim |
| 1120 | A | 28 0 0 | .. | .. | ½ mile S.E. of Wattle Flat, Dunolly | Under 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 1121 | A | 28 0 0 | .. | .. | 1 mile South of Wattle Flat, Dunolly | Under 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 1122 | A | 28 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | .. | .. .. .. | W. H. Ferguson | |
| 1123 | A | 27 10 0 | 27 6 0 | .. | Blink Bonny Creek, near Freestone Creek, Briagolong | 6½ feet | .. | .. | 9.9.1870 | Rasmus Thomson and party | W. Foster, Warden, Nugget Book | |

LIST OF NUGGETS FOUND IN VICTORIA—*continued*.

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1124 | A | 27 10 0 | .. | .. | Poseidon Lead, Tarnagulla | 27 feet | .. .. | —.12.1906 | O'Brien and party .. | A. M. Howitt, Records, Vol. III., Pt. I. | On the bedrock |
| 1125 | A | 27 0 0 | 27 0 0 | .. | Berlin, Kangderaar | 8 to 12 inches | .. .. | 20.7.1870 | Ah Yea and party .. | F. K. Orme, Warden, Nugget Book | All gold |
| 1126 | A | 27 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | C. Desanti and party | Nugget Book | |
| 1127 | A | 27 0 0 | .. | .. | Nick-of-Time Lead, Tarnagulla | 50 feet | .. .. | About 1905 | Irishman's Claim .. | A. M. Howitt, Records, Vol. III., Pt. I. | |
| 1128 | Q | 27 0 0 | .. | .. | Woah Hawp Canton Mine, Ballaarat | 750 to 930 feet | .. .. | —.4.1910 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 4th April, 1910 | Specimen. On indicator |
| 1129 | A | 27 0 0 | .. | .. | Whipstick, Bendigo | .. | .. .. | —.10.1868 | .. .. .. | Dicker's Mining Record, October, 1868, p. 93 | |
| 1130 | A | 27 0 0 | .. | .. | 1 mile South of Wattle Flat, Dunolly | 20 feet | .. .. | —.12.1865 | .. .. .. | Dicker's Mining Record, December, 1865, p. 409 | |
| 1131 | A | 27 0 0 | .. | .. | Jones' Creek, Waanyarra | 26 feet | .. .. | 1903 | Lockett and Scholes | Nugget Book | |
| 1132 | A | 27 0 0 | .. | .. | Cumberland Reef, Castlemaine | .. | .. .. | Prior to 1869 | .. .. .. | Mining Surveyors' Reports, p. 377, R. B. Smyth's Gold-fields, &c. | |
| 1133 | A | .. | .. | 27 0 0 | Golden Point, Blackwood | On surface | .. .. | 31.3.1869 | A party of Chinese .. | J. F. Hansen, Mining Registrar, Nugget Book | |
| 1134 | A | 27 0 0 | .. | .. | Baker's Gully, Dunolly | 6 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372, R. B. Smyth's Gold-fields, &c. | |
| 1135 | A | 27 0 0 | .. | .. | Berlin Diggings, Kangderaar | 11½ feet | .. .. | —.7.1869 | .. .. .. | F. Knox Orme, Warden, Nugget Book | |
| 1136 | A | 27 0 0 | .. | .. | Gooseberry Flat, Dunolly | 40 feet | .. .. | 1866 | .. .. .. | F. K. Orme, p. 373, R. Brough Smyth's Gold-fields, &c. | |
| 1137 | A | 27 0 0 | .. | .. | Tyler's Rush, Berlin, Kangderaar | About 9 feet | .. .. | 12.1.1870 to 24.3.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1138 | A | 27 0 0 | .. | .. | Tyler's Rush, Berlin, Kangderaar | About 9 feet | .. .. | 12.1.1870 to 24.3.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1139 | A | 27 0 0 | 27 0 0 | .. | Berlin Diggings, Kangderaar | 8 to 12 inches | .. .. | 20.7.1870 | Ah Yea and party .. | F. K. Orme, Warden, Nugget Book | In red clay. All gold |
| 1140 | A | 27 0 0 | .. | .. | Township of Goldsborough, Dunolly | 3 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 1141 | A | 27 0 0 | .. | .. | Old Lead, Dunolly | 10–60 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 1142 | A | 27 0 0 | .. | .. | Milkmaid's Gully, near Wattle Flat, Dunolly | Shallow | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 1143 | A | 26 15 0 | 25 15 0 | .. | Gibraltar, Majorca, Parish of Craigie | .. | .. .. | —.4.1862 | Ekerstein .. .. | Dicker's Mining Record, April, 1862, p. 16 | The gold was found in a boulder of quartz |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1144 | A | 26 14 0 | .. | .. | Berlin Rush, Kangderaar | .. | .. | .. | 26.6.1869 | Criss and party .. | R. Mason, Mining Registrar, Nugget Book | |
| 1145 | A | 26 14 0 | .. | .. | Hoffnung Co., Amherst | 100 feet | .. | .. | 11.5.1876 | Hoffnung Co. .. | Progress Report No. IV., p. 49 | In shape like a heart |
| 1146 | A | 26 11 0 | .. | .. | Break-of-Day, Rokewood | .. | .. | .. | —.4.1866 | Break-of-Day Mg. Co. | Dicker's Mining Record, April, 1866, p. 252 | |
| 1147 | A | 26 10 0 | .. | .. | Berlin Rush, Kangderaar | .. | .. | .. | 19.9.1910 | .. .. .. | Nugget Book | |
| *1148 | A | 26 9 0 | .. | .. | Little Wonder Mine, Taradale | 140 feet | .. | .. | 26.3.1880 | Little Wonder Mining Co. | Progress Report No. VII., p. 125 | |
| 1149 | A | 26 8 0 | 25 0 0 | .. | Poseidon Lead, Tarnagulla | 71 feet | .. | .. | 1908 | Little Homeward Bound Claim | A. M. Howitt | |
| 1150 | A | 26 7 0 | .. | .. | Creswick .. | .. | .. | .. | —.4.1866 | .. .. .. | Dicker's Mining Record, April, 1866, p. 276 | |
| 1151 | A | 26 3 0 | .. | .. | Italian Point, Wedderburne | 13 feet | .. | .. | 30.11.1875 | Stephen Salovitch .. | Progress Report No. IV., p. 49 | Wedge shaped |
| 1152 | A | 26 2 0 | .. | 20 19 18 | Kitty's Lead, Buninyong | 1 foot | .. | .. | 8.11.1870 | .. .. .. | Nugget Book | |
| 1153 | A | 26 1 0 | .. | .. | Berlin Rush, Kangderaar | .. | .. | .. | 27.4.1869 | Freeman and party .. | R. Mason, Mining Registrar, Nugget Book | |
| 1154 | A | 26 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 25 feet | .. | .. | —.12.1906 | Cummins and party | A. M. Howitt .. .. .. | On the bedrock |
| 1155 | A | 26 0 0 | .. | .. | Keep-it-dark Gully, Hepburn | .. | .. | .. | Prior to 1868 | .. .. .. | Mining Surveyors' Reports, p. 378 R. Brough Smyth's Gold-fields, &c. | |
| 1156 | Q | 26 0 0 | .. | .. | Norfolk Reef, Dunolly | 10 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 1157 | A | 26 0 0 | .. | .. | Wattle Flat, Dunolly | Under 20 feet | .. | .. | 24.4.1866 | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 1158 | A | 26 0 0 | .. | .. | Wattle Flat, Dunolly | 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 1159 | A | 26 0 0 | .. | .. | Berlin Rush, Kangderaar | .. | .. | .. | 19.9.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1160 | A | 26 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 45 feet | .. | .. | 8.4.1907 | Watts and party .. | A. M. Howitt | |
| 1161 | A | 26 0 0 | .. | .. | Wattle Flat, Dunolly | Under 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Report | |
| 1162 | A | 26 0 0 | .. | .. | Butler's Paddock, Holcombe | 80 feet | .. | .. | —.6.1887 | Adams and party .. | Mining Registrars' and Surveyors' Reports, June, 1887, p. 26 | |
| 1163 | A | 26 0 0 | .. | .. | Jones' Creek, Parish of Waanyarra | 26 feet | .. | .. | 1903 | J. Conolly and party | Nugget Book | |
| 1164 | A | 25 10 0 | .. | .. | Waranga .. | .. | .. | .. | —.7.1875 | Henry Snelling .. | J. G. Taylor, Warden, Nugget Book | |
| 1165 | A | 25 5 0 | .. | .. | Yorkey's Gully, Parish of Wombat, | About 9 feet | .. | .. | 16.10.1894 | Leopold and party .. | W. Trenkner, Mining Registrar, Nugget File | |
| 1166 | A | 25 5 0 | .. | .. | Amherst .. .. | .. | .. | .. | 9.7.1875 | .. .. .. | Joseph Smith, Mining Surveyor, Nugget Book | Flat on one side |
| 1167 | A | 25 1 0 | .. | 23 16 6 | Kitty's Lead, Buninyong | 1 foot | .. | .. | —.11.1870 | McKenzie and party | S. D. S. Huyghue, Warden's Clerk, Nugget Book | Found in red clay |
| 1168 | A | 25 0 0 | .. | .. | Bismarck Lead, Dunolly | Under 20 feet | .. | .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map, No. 53D, S.W. | |
| 1169 | A | 25 0 0 | .. | .. | Blue Gully, Blackwood | 5 feet | .. | .. | Prior to 16.7.1908 | .. .. .. | Nugget Book | |
| 1170 | A | 25 0 0 | 25 0 0 | .. | Red Streak Rush, Dunolly | Under 50 feet | .. | .. | —.5.1879 | .. .. .. | W. G. Couchman, Mining Registrar, Nugget Book | Pure gold |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1171 | A | 25 0 0 | .. | .. | Prince of Wales Mine, Dunolly | 50 feet | .. .. | —.6.1875 | Prince of Wales Mg. Co. | Mining Registrars' and Surveyors' Reports, June, 1875, p. 33 | |
| 1172 | A | 25 0 0 | .. | .. | Spark's Gully, Moliagul | 10 feet | .. .. | 1860 | .. .. .. | F. K. Orme, p. 372 R. Brough Smyth's Gold-fields, &c. | |
| 1173 | A | 25 0 0 | .. | .. | 1½ miles south of Wattle Flat, Dunolly | Under 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map. No. 53D, S.W. | |
| 1174 | A | 25 0 0 | .. | .. | Adelaide Lead, Maryborough | .. | .. .. | —.6.1862 | .. .. .. | Dicker's Mining Record. June, 1862. p. 3 | |
| 1175 | A | 25 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 67 feet | .. .. | 7.10.1908 | Yates and party .. | A. M. Howitt | |
| 1176 | A | 25 0 0 | .. | .. | Old Lead, Dunolly | 15 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Quarter-sheet Map. No. 53D, S.W. | |
| 1177 | A | 25 0 0 | .. | .. | Leviathan Mine, Napoleon's Lead, Buninyong | .. | .. .. | —.7.1865 | Leviathan Mining Co. | Dicker's Mining Record, July, 1866, p. 17 | |
| 1178 | A | 25 0 0 | .. | .. | German Gully, Amherst | .. | .. .. | 9.7.1875 | .. .. .. | Progress Report No. III., p. 119 | |
| 1179 | A | 25 0 0 | .. | .. | Majorca .. .. | .. | .. .. | —.12.1868 | .. .. .. | Dicker's Mining Record. December, 1868, p. 152 | |
| 1180 | A | 25 0 0 | 14 0 0 | .. | Poseidon Lead, Targulla | 10 feet | .. .. | 25.5.1907 | Jackson and Hughes | A. M. Howitt | |
| 1181 | A | 25 0 0 | .. | .. | MacMahon's Creek, 12 miles from Mitta Mitta Post Office | Shallow | .. .. | 25.7.1897 | .. .. .. | Nugget File | |
| 1182 | A | 25 0 0 | .. | .. | Smith's Gully, Kingower | 5 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 1183 | A | 25 0 0 | .. | .. | Paddy's Gully, Kangderaar | 12 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 1184 | Q | 25 0 0 | .. | .. | New Normanby Mine, Ballarat | 1,400 feet | .. .. | —.10.1909 | New Normanby Mining Co. | *Age* Newspaper, 6th October, 1909 | On indicator |
| 1185 | Q | 25 0 0 | .. | .. | Woah Hawp Canton Mine, Ballarat | 750 feet | .. .. | —.12.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 11th December, 1909 | On indicator |
| *1186 | A | 25 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 80 feet | .. .. | 31.10.1910 | "Dividend Syndicate" | A. M. Howitt | |
| 1187 | A | 25 0 0 | .. | .. | Nick-of-Time Lead, Tarnagulla | 15 feet | .. .. | About 1903 | Yeo, Hatt, and Bravo | A. M. Howitt, Records, Vol. III., Pt. 1 | |
| 1188 | A | 25 0 0 | .. | .. | Nick-of-Time Lead, Tarnagulla | 17 feet | .. .. | About 1903 | Yeo, Hatt, and Bravo | A. M. Howitt, Records, Vol. III., Pt. 1 | |
| 1189 | A | 25 0 0 | .. | 14 0 0 | Poseidon Lead, Tarnagulla | 10 feet | .. .. | 20.5.1907 | Jackson and Hughes | A. M. Howitt | |
| 1190 | A | 25 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 67 feet | .. .. | 7.10.1907 | Yates and party .. | A. M. Howitt | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1191 | A | 25 0 0 | 15 10 0 | .. | Ironbark Gully, Tarnagulla | 4½ feet | .. .. | —.6.1910 | Fossicker .. .. | *Age* Newspaper, 13th June, 1910 | Close to "Magnum Bonum" |
| 1192 | A | 24 16 0 | 24 10 0 | .. | Green Gully, Hepburn, Parish of Franklin | 20 feet | .. .. | 20.10.1869 | Shearman and party | T. Hale, Mining Registrar, Nugget Book | Honeycombed, and nearly solid gold |
| *1193 | A | 24 9 0 | .. | .. | Midas Co.'s Mine, Sulky Gully, Ascot | 82 feet | .. .. | 3.3.1887 | Midas Gold Mining Co. | Nugget Book | |
| *1194 | A | 24 7 0 | .. | 24 3 0 | Broomfield's Gully, Creswick | 100 feet | .. .. | 8.8.1872 | L. K. Carter and party | J. Stevenson, Mining Surveyor, Nugget Book | In yellow clay |
| 1195 | A | 24 4 0 | 22 6 0 | .. | Positano Syndicate, Poseidon Lead, Tarnagulla | 72 feet | .. .. | 21.7.1908 | Dickenson, Kelsall, and party | A. M. Howitt | |
| 1196 | A | 24 0 0 | .. | .. | Burnt Creek, Dunolly | 20 feet | .. .. | 15.12.1908 | Burnt Creek Dredging Co. | W. H. Ferguson | |
| 1197 | A | 24 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 80 feet | .. .. | 19.7.1909 | Poseidon United Mining Co. | A. M. Howitt | |
| 1198 | A | 24 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 4 feet | .. .. | 8.4.1907 | Cullen and Yates | A. M. Howitt | |
| 1199 | A | 24 0 0 | .. | 16 0 0 | Daisy Hill, Amherst | Surface | .. .. | 1849 | Thos. Chapman, Whitechapel, England | Dicker's Mining Record, May, 1863, p. 119 | First nugget bought in Melbourne Mrs. Brentani, purchaser |
| 1200 | A | 24 0 0 | .. | .. | Caledonia Gully, Red Hill, Heathcote | Shallow | .. .. | —.9.1874 | E. Bride .. .. | J. T. Strong, Mining Registrars' and Surveyors' Reports, September, 1874, p. 32 | |
| 1201 | A | 24 0 0 | .. | .. | Red Streak Lead, Dunolly | 40 feet | .. .. | 5.6.1879 | .. .. .. | Progress Report No. VI., p. 35 | |
| 1202 | A | 24 0 0 | .. | 19 0 0 | Harrison's Hill, near Blucher's Gully, Carisbrook | On surface | .. .. | 8.3.1879 | —. Tregardi .. | Progress Report No VI., p. 35 .. | Rough and associated with quartz |
| 1203 | A | 24 0 0 | .. | .. | Berlin Diggings, Kingower | Shallow | .. .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1204 | Q | 24 0 0 | .. | .. | "The Advance" Mine, East Victoria Line, Bendigo | 220 feet | .. .. | —.10.1867 | Advance Mining Co. | Dicker's Mining Record, October, 1867, p. 156 | Upwards of 170 ozs. in nuggets were obtained at this depth |
| 1205 | A | 24 0 0 | .. | .. | Berlin Diggings, Kingower | 14 feet | .. .. | 19.9.1870 | .. .. .. | F. K. Orme, Mining Registrar, Nugget Book | |
| 1206 | A | 24 0 0 | .. | .. | Berlin Diggings, Kingower | 14 feet | .. .. | 19.9.1870 | .. .. .. | F. K. Orme, Mining Registrar, Nugget Book | |
| 1207 | A | 24 0 0 | .. | .. | Happy Valley, Queenstown | Shallow | .. .. | Prior to 1869 | .. .. .. | Mining Surveyors' Reports, p. 378, R. Brough Smyth's Gold-fields, &c. | |
| 1208 | A | 24 0 0 | .. | .. | United Extended, Band of Hope, Ballarat | Deep | .. .. | —.12.1867 | United Extended Band of Hope Mining Co. | Dicker's Mining Record, December, 1867, p. 237 | Presented to H.R.H. the Duke of Edinburgh on the occasion of his visiting the mine |
| 1209 | A | 24 0 0 | .. | .. | Shanty Jack's Gully, neighbourhood of Dunolly | 25 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |
| 1210 | A | 24 0 0 | 9 0 0 | .. | Coate's Lead, Parish of Wareek | Shallow | .. .. | .. | .. .. .. | A. M. Howitt, Memoir No. XI. | |
| 1211 | Q | 24 0 0 | .. | .. | New Reef, near the Old Working Miner's Claim, Homebush | About 2 feet | .. .. | 7.8.1908 | Nichols and Nicholas and party | Nugget Book | |
| 1212 | A | 24 0 0 | .. | .. | Koh-i-noor Mine, Ballarat | 400 feet | .. .. | —.7.1868 | Koh-i-noor Mining Co. | Dicker's Mining Record, July, 1868, p. 31 | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. | | | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross. | Net. | Estimated. | | | | | | | |
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1213 | A | 24 0 0 | .. | .. | Raywood Gully, Raywood | Shallow | .. .. | —.11.1863 | .. .. .. | Dicker's Mining Record, November, 1863, p. 239 | |
| 1214 | A | 24 0 0 | 19 2 0 | .. | Positano Syndicate, Poseidon Lead, Tarnagulla | 72 feet | .. .. | 22.6.1908 | Dickenson, Kelsall, and party | A. M. Howitt | |
| 1215 | A | 24 0 0 | 18 10 18 | .. | Newcastle Co.'s Claim, Bottle Hill, Carngham | .. | .. .. | —.11.1863 | Newcastle Mining Co. | Dicker's Mining Record, November, 1863, p. 252 | The gold was honeycombed, but did not appear to be waterworn |
| 1216 | A | 24 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 2 feet | .. .. | 8.4.1907 | Woodall and party .. | A. M. Howitt .. .. .. | Found near the "Poseidon" nugget |
| 1217 | A | 24 0 0 | .. | .. | Belgian Rush, Nuggetty Gully, Dunnolly | Surface to 8 feet | .. .. | - -.11.1865 | Prospector's Claim .. | Dicker's Mining Record, November, 1865, p. 348 | |
| 1218 | A | 24 0 0 | .. | .. | New Company's Mine, Buninyong | .. | .. .. | —.4.1868 | New Company Mining Co. | Dicker's Mining Record, April, 1868, p. 113 | |
| 1219 | A | 24 0 0 | .. | .. | Wattle Flat, Dunolly | Under 20 feet | .. .. | —.10.1868 | .. .. .. | Dicker's Mining Record, October, 1868, p. 93 | |
| 1220 | A | 24 0 0 | .. | .. | Langham Flat, Kangderaar | 9 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report June, 1890, p. 16 | |
| 1221 | A | 24 0 0 | .. | .. | Near Humbug Hills, Moliagul | Shallow | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| *1222 | A | 24 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 11 feet | One of "The Twins" | 1.1.1907 | Wragge Bros. .. | A. M. Howitt, Records, Vol. III., Part I. | On the bedrock |
| 1223 | A | 23 16 3 | .. | .. | Berlin Rush, Kangderaar | Shallow | .. .. | 19.6.1869 | A party of Germans .. | R. Mason, Mining Registrar, Nugget Book | |
| 1224 | A | 23 16 0 | .. | 23 12 0 | Duke's Freehold Mine, Spring Hill Creswick | 280 feet | .. .. | 23.9.1878 | Duke's Freehold Mining Co. | J. Stevenson, Mining Surveyor, Nugget Book | |
| *1225 | A | 23 15 0 | .. | .. | Poseidon Lead, Tarnagulla | 11 feet | One of "The Twins" | 1.1.1907 | Wragge Bros. .. | A. M. Howitt, Records, Vol. III., Part I. | On the bedrock |
| 1226 | A | 23 6 0 | 23 6 0 | .. | Old Tom Gully, Hepburn | 5 feet | .. .. | 25.8.1875 | A party of sluicers .. | Thomas Hale, Mining Registrar, Nugget Book | One side was honeycombed. Pure gold |
| 1227 | A | 23 5 0 | .. | 21 11 12 | Norfolk Gully, Stony Creek, Parish of Amherst | 25 feet | .. .. | 26.2.1876 | A youth named Hill .. | Joseph Smith, Mining Surveyor, Nugget Book | Honeycombed, with quartz attached |
| 1228 | A | 23 4 0 | .. | .. | No. 1 South Claim, Foster | .. | .. .. | 30.9.1893 | Brown and party .. | J. Mooney, Mining Registrar, Nugget File | |
| 1229 | A | 23 0 0 | .. | .. | Berlin Flat, Kangderaar | Shallow | .. .. | 19.9.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1230 | A | 23 0 0 | .. | .. | Nuggetty Gully, Blackwood | Shallow | .. .. | .. | .. .. .. | Mining Surveyors' Reports, p. 376, R. Brough Smyth's Gold-fields, &c. | 4 ozs. of quartz attached to the nugget |
| 1231 | A | 23 0 0 | .. | .. | Surface Hill, Ararat | At surface | .. .. | 12.9.1910 | .. .. .. | Nugget Book | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1232 | A | 23 0 0 | .. | 12 3 0 | Nichol's Freehold, Amherst | 106 feet | .. | .. | 12.4.1870 | Nichol's Freehold Mining Co. | J. Smith, Mining Surveyor, Nugget Book | Honeycombed |
| 1233 | A | 23 0 0 | .. | .. | Berlin Diggings, Kingower | Shallow | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1234 | A | 23 0 0 | 11 10 0 | .. | Poseidon Lead, Tarnagulla | 60 feet | .. | .. | 10.2.1908 | Williams and Glover | A. M. Howitt | |
| 1235 | .. | 23 0 0 | .. | .. | Old Lead, Dunolly.. | 30 feet | .. | .. | —.12.1881 | .. .. .. | W. H. Ferguson .. .. | Parcel of nuggets |
| 1236 | A | 23 0 0 | .. | .. | New Band of Hope, Cockatoo, Amherst, Parish of Craigie | .. | .. | .. | —.3.1871 | New Band of Hope Mining Co. | Joseph Smith, Mining Registrars' and Surveyors' Reports, March, 1871, p. 31 | |
| 1237 | A | 23 0 0 | .. | .. | Godfrey's Creek, Alexandra | .. | .. | .. | —.1.1869 | .. .. .. | Dicker's Mining Record, 2nd January, 1869 | |
| 1238 | A | 22 15 0 | .. | .. | Hard Hills, Talbot | 3 feet | .. | .. | 26.10.1865 | .. .. .. | Nugget Book | |
| 1239 | A | 22 15 0 | .. | .. | Neighbourhood of Dunolly | 10 to 60 feet | .. | .. | —.6.1866 | .. .. .. | Dicker's Mining Record, June, 1866, p. 425 | |
| 1240 | A | 22 10 0 | .. | 21 10 0 | Mt. Greenock, Parish of Amherst | 300 feet | .. | .. | 5.11.1875 | Union Mining Co. .. | Joseph Smith, Mining Registrar, Nugget Book | Honeycombed |
| 1241 | A | 22 6 0 | .. | 22 0 0 | Band of Hope Mine, Maryborough | 233 feet | .. | .. | 5.3.1872 | Band of Hope Mining Co. | Peter Virtue, jun., Mining Registrar, Nugget Book | Rounded and waterworn |
| *1242 | A | 22 6 0 | .. | .. | Poseidon Lead, Tarnagulla | 11 feet | "Little Nell" .. | | 4.2.1907 | Wragge Bros. .. | A. M. Howitt, Records, Vol. III., Part I. | Found 10 inches above the bedrock |
| 1243 | A | 22 4 0 | .. | .. | Wedderburne | 10 feet | .. | .. | 9.2.1876 | G. Bellingham and party | J. Reach, Mining Registrar, Nugget Book | In black gravel; waterworn |
| 1244 | A | 22 2 16 | .. | .. | Yorkey's Gully, Parish of Wombat, Daylesford | 9 feet | .. | .. | 16.10.1894 | Leopold and party .. | W. Trenkner, Mining Registrar, Nugget File | |
| 1245 | A | 22 1 0 | 19 5 0 | .. | Kangaroo Gully, Amherst | 20 feet | .. | .. | .. | A German .. .. | J. Smith, Mining Registrar, Nugget Book | |
| 1246 | A | 22 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 72 feet | .. | .. | 1908 | Mackenzie and party | A. M. Howitt | |
| 1247 | A | 22 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 11 feet | .. | .. | 7.3.1907 | Wragge Bros. .. | A. M. Howitt | |
| 1248 | A | 22 0 0 | .. | .. | Berlin Diggings, Kangderaar | 11½ feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1249 | A | 22 0 0 | .. | .. | Berlin Diggings, Kangderaar | .. | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1250 | A | 22 0 0 | .. | .. | Norfolk Gully, Stoney Creek, Amherst | .. | .. | .. | —.3.1876 | .. .. .. | J. Smith, Mining Registrars' and Surveyors' Reports, March, 1876, p. 31 | Gold honeycombed in character and associated with quartz |
| 1251 | A | 22 0 0 | .. | .. | Gipsy Diggings, Dunolly | 10 to 20 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1252 | A | 22 0 0 | .. | .. | Gipsy Diggings, Dunolly | 10 to 20 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1253 | A | 22 0 0 | .. | 21 12 0 | Green Gully, Glenlyon | 20 feet | .. | .. | 23.3.1871 | George Marriott .. | Mark Amos, Mining Surveyor, Nugget Book | A flat piece of gold, and a little fine gold in vicinity |
| 1254 | Q | 22 0 0 | .. | .. | Woah Hawp Canton Mine, Ballarat | 850 feet | .. | .. | —.10.1909 | Woah Hawp Canton Mining Co. | *Age* Newspaper, 21st October, 1909 | On indicator |
| 1255 | A | 22 0 0 | .. | .. | Welbaum Reef, Raywood | 4 feet | .. | .. | Prior to 1868 | .. .. .. | Mining Surveyors' Reports, p. 376 R. Brough Smyth's Gold-fields, &c. | |
| 1256 | A | 22 0 0 | .. | .. | Homeward Bound, Nick o' Time Lead, Tarnagulla | 50 feet | .. | .. | About 1904 | Homeward Bound Mining Co. | A. M. Howitt, Records, Vol. III., Part I. | |
| 1257 | A | 22 0 0 | .. | .. | New Bendigo Rush, St. Arnaud | .. | .. | .. | .. | .. .. .. | F. K. Orme, p. 377 R. Brough Smyth's Gold-fields, &c. | In washdirt 2 feet to 5 feet in thickness |

## List of Nuggets found in Victoria—*continued.*

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. Gross. | Weights. Net. | Weights. Estimated. | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1258 | A | 22 0 0 | .. | .. | Victoria Gully, Taradale | .. | .. .. | .. | .. .. .. | F. K. Orme, p. 377 R. Brough Smyth's Gold-fields, &c. | Found on sandstone bottom with smaller nuggets |
| 1259 | A | 22 0 0 | .. | .. | Quaker's Gully, neighbourhood of Dunolly | Shallow | .. .. | 1858 | .. .. .. | F. K. Orme, p. 372 R. Brough Smyth's Gold-fields, &c. | |
| 1260 | A | 22 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |
| 1261 | A | 22 0 0 | .. | .. | Cosmopolitan Mine, Ballaarat | .. | .. .. | —.10.1862 | Cosmopolitan Mining Co., Ballaarat | Dicker's Mining Record, October, .1862, p. 8 | |
| 1262 | A | 22 0 0 | .. | .. | Berlin Rush, Kangderaar | 11½ feet | .. .. | —.7.1869 | .. .. .. | F. Knox Orme, Warden, Nugget Book | |
| 1263 | A | 22 0 0 | .. | .. | Berlin Rush, Kangderaar | .. | .. .. | —.12.1869 | .. .. .. | F. Knox Orme, Warden, Nugget Book | |
| 1264 | A | 22 0 0 | .. | .. | Turkey Flat, Dunolly | 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1265 | A | 22 0 0 | .. | .. | Bismarck Lead, Dunolly | 25 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1266 | A | 22 0 0 | .. | 21 12 0 | Green Gully, Holcombe | 20 feet | .. .. | 23.3.1871 | George Marriott .. | Mark Amos, Mining Surveyor, Nugget Book | Flat |
| 1267 | A | 21 14 0 | 21 8 0 | .. | Avoca Lead, Avoca | 107 feet | .. .. | 13.9.1873 | Trevithick and party | P. Simpson, Mining Surveyor, Nugget Book | Waterworn and associated with quartz crystals |
| 1268 | A | 21 10 0 | .. | 16 0 0 | Fryer's Creek, Parish of Fryers | 16 feet | .. .. | 1854 | George Williams .. | Progress Report No. III., p. 118 | |
| 1269 | A | 21 8 0 | .. | .. | Corinella Extended Mine, Eganstown, Daylesford | About 30 feet | .. .. | 19.1.1895 | Corinella Extended Mining Co. | W. Trenkner, Mining Registrar, Nugget File | |
| 1270 | Q | 21 0 0 | .. | .. | Norfolk Reef, Dunolly | Near surface | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1271 | A | 21 0 0 | .. | .. | Storekeepers' Gully, Rushworth, | .. | .. .. | .. | .. .. .. | Norman Taylor, Mining Registrar's Report, March, 1886, p. 92 | |
| 1272 | A | 21 0 0 | 15 0 0 | .. | Poseidon Lead, Tarnagulla | 38 feet | .. .. | 10.6.1907 | Tormey and Hines .. | A. M. Howitt | |
| 1273 | A | 21 0 0 | .. | .. | Berlin Rush, Kangderaar | 11½ feet | .. .. | —.8.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1274 | A | 21 0 0 | .. | .. | Cleeland's Gully, Parish of Kangderaar | 5 feet | .. .. | .. | .. .. .. | E. J. Dunn, Quarterly Report, June, 1890, p. 16 | |
| 1275 | A | 21 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 1ft. 3 in. | .. .. | About 1907 | Smith, Stephenson, and Rogers | A. H. Howitt, Records, Vol. III., Part I. | A few inches above the bedrock |
| 1276 | A | 21 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 13 feet | .. .. | 25.2.1907 | Mackenzie and party | A. M. Howitt, Records, Vol. III., Part I. | |
| 1277 | A | 21 0 0 | 18 15 0 | .. | Poseidon Lead, Tarnagulla | 64 feet | .. .. | 21.10.1907 | Douthat and Brown | A. M. Howitt | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1278 | A | 21 0 0 | .. | .. | Between Bell Rock and St. Arnaud | 2 to 3 feet | .. | .. | 28.2.1871 | Theodore Cerrel .. | P. Simpson, Mining Surveyor, Nugget Book | Found in red clay and associated with blue slate and quartz |
| 1279 | A | 21 0 0 | .. | 20 17 0 | Freestone Creek, Lower Gladstone | 13 feet | .. | .. | 19.7.1872 | Patrick McKenna .. | W. Foster, Warden, Nugget Book | Flat and waterworn |
| 1280 | A | 21 0 0 | 20 0 0 | .. | Pound Rush, Dunolly | Under 30 feet | .. | .. | —.11.1865 | .. .. .. | Dicker's Mining Record, November, 1865, p. 348 | |
| 1281 | A | 21 0 0 | .. | .. | Poseidon Lead, Tarnagulla | About 85 feet | .. | .. | —.8.1912 | Poseidon United Mining Co. | *Age* Newspaper, 9th August, 1912 | |
| *1282 | A | 20 16 0 | .. | 20 0 0 | Wedderburne .. | 3½ feet | .. | .. | 1.3.1881 | Edward Jones .. | Progress Report No. VII., p. 125 | |
| *1283 | A | 20 13 0 | .. | .. | Yankee Gully, Amherst | 14 feet | .. | .. | 18.5.1908 | Amherst Flat Dredging Co. | Nugget Book | |
| 1284 | A | 20 12 0 | .. | 18 5 18 | Simmon's Reef, Blackwood | 6½ feet | .. | .. | 17.9.1875 | Robert Skinner and Son | Progress Report No. III., p. 119 | Honeycombed |
| 1285 | A | 20 0 0 | .. | .. | Old Lead, Dunolly | 10 to 60 feet | .. | .. | Prior to 7.10.1867 | .. .. .. | W. H. Ferguson's Quarter Sheet Map, No. 53D S.W. | |
| 1286 | A | 20 0 0 | 19 0 0 | .. | Woodstock Station, Parish of Lillicur | 21 feet | .. | .. | 12.3.1896 | Mitchell and party .. | A. Roffey, Mining Registrar, Nugget File | |
| 1287 | A | 20 0 0 | .. | .. | Berlin, Kangderaar | 12 feet | .. | .. | 19.9.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1288 | A | 20 0 0 | .. | .. | Old Lead, Dunolly | 40 feet | .. | .. | 1867 | .. .. .. | F. K. Orme, p. 373 R. Brough Smyth's Gold-fields, &c. | |
| 1289 | A | 20 0 0 | .. | .. | Berlin, Kangderaar | 9 feet | .. | .. | Between 24.3.1870 and 20.6.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1290 | A | 20 0 0 | .. | .. | Berlin Kangderaar | 9 feet | .. | .. | .. | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1291 | A | 20 0 0 | .. | .. | Gipsy Diggings, Dunolly | 10 to 20 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1292 | A | 20 0 0 | .. | .. | Gipsy Diggings, Dunolly | 10 to 20 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1293 | A | 20 0 0 | .. | .. | Gipsy Diggings, Dunolly | 10 to 20 feet | .. | .. | Prior to 31.12.1868 | .. .. .. | F. K. Orme, p. 375 R. Brough Smyth's Gold-fields, &c. | |
| 1294 | A | 20 0 0 | .. | .. | Mountain Creek, Moonambel | 65 feet | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 377 R. Brough Smyth's Gold-fields, &c. | |
| 1295 | A | 20 0 0 | .. | .. | Happy Valley, Queenstown | .. | .. | .. | .. | .. .. .. | Mining Surveyors' Reports, p. 378 R. Brough Smyth's Gold-fields, &c. | |
| 1296 | A | 20 0 0 | .. | .. | Whipstick, Red Jacket Gully, 2½ miles north of Eaglehawk | .. | .. | .. | —.4.1863 | .. .. .. | Dicker's Mining Record, April, 1863, p. 100 | |
| 1297 | A | 20 0 0 | .. | .. | Wattle Flat, Malmsbury | .. | .. | .. | —.11.1865 | Wattle Flat Claim .. | Dicker's Mining Record, November, 1865, p. 328 | |
| 1298 | A | 20 0 0 | .. | .. | Belgian Rush, Nuggetty Gully, Dunolly | 1 to 10 feet | .. | .. | —.11.1865 | .. .. .. | Dicker's Mining Record, November, 1865. p. 334 | |
| 1299 | A | 20 0 0 | .. | .. | Gooseberry Hill, Dunolly | 10 to 60 feet | .. | .. | —.11.1865 | Lord Palmerston Mining Co. | Dicker's Mining Record, November, 1865, p. 334 | |
| 1300 | A | 20 0 0 | .. | .. | Golden Lake, Homebush, Avoca | .. | .. | .. | —.10.1868 | Golden Lake Claim .. | Dicker's Mining Record, October, 1868, p. 101 | |
| 1301 | A | 20 0 0 | .. | .. | Berlin Rush, Kangderaar | 11½ feet | .. | .. | —.9.1869 | .. .. .. | F. K. Orme, Warden, Nugget Book | |

| No. of Nugget. | Whether found in Quartz or Alluvial. | Weights. | | | Where found. | Depth. | Name of Nugget. | Date when found. | Finders. | Authority. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross. | Net. | Estimated. | | | | | | | |
| | | oz. dwt. gr. | oz. dwt. gr. | oz. dwt. gr. | | | | | | | |
| 1302 | A | 20 0 0 | .. | .. | Tyler's Rush, Berlin, Kangderaar | 12 feet | .. .. | Between 12.1.1870 and 24.3.1870 | .. .. .. | F. K. Orme, Warden, Nugget Book | |
| 1303 | A | 20 0 0 | .. | .. | Patchy Flat, Whipstick, Bendigo | 9 feet | .. .. | 2.10.1873 | .. .. .. | Progress Report No. II., p. 58 .. | Flat and irregular |
| 1304 | A | 20 0 0 | .. | .. | Golden Point, Blackwood | Shallow | .. .. | —.3.1884 | A party of Chinese .. | Mining Registrars' and Surveyors' Reports, March, 1884, p. 30 | |
| 1305 | A | 20 0 0 | .. | .. | Between Bell Rock and St. Arnaud | 2 to 3 feet | .. .. | 30.2.1871 | Theodore Cerrel .. | P. Simpson, Mining Surveyor, Nugget Book | Found in red clay, associated with blue slate and quartz |
| 1306 | A | 20 0 0 | .. | .. | Bloomfield Gully, Creswick | 100 feet | .. .. | —.6.1872 | L. Carter .. .. | James Stevenson, Mining Surveyor | |
| 1307 | A | 20 0 0 | .. | .. | Close to Calder's Reef, Parish of Waanyarra | Shallow | .. .. | .. | .. .. .. | A. M. Howitt, Records, Vol. III., Part II. | |
| 1308 | A | 20 0 0 | .. | .. | German Gully, about 2 miles south-west of Franklinford | Shallow | .. .. | —.9.1875 | .. .. .. | G. Ulrich, Geologist, Quarter Sheet Map, No. 15 S.E. | |
| 1309 | A | 20 0 0 | .. | .. | Brown's Golden Age Co-operative Mine, Scarsdale | 150 feet | .. .. | About 8.4.1880 | Golden Age Co-operative Mining Co. | John Lynch, Mining Surveyor, Nugget Book | Found lying on the reef |
| 1310 | A | 20 0 0 | .. | .. | The Upper Gladstone | .. | .. .. | —.6.1870 | Thornton and party | A. F. Walker, Mining Registrars' and Surveyors' Reports, June, 1870, p. 41 | |
| 1311 | A | 20 0 0 | .. | .. | Little Homeward Bound, Poseidon, Tarnagulla | 71 feet | .. .. | About 14.9.1908 | Baker and party .. | A. M. Howitt | |
| 1312 | A | 20 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 85 feet | .. .. | 10.8.1910 | Junction Syndicate .. | A. M. Howitt | |
| 1313 | A | 20 0 0 | .. | .. | Poseidon Lead, Tarnagulla | 10 feet | .. .. | About 1907 | Jackson and party .. | A. M. Howitt, Records, Vol. III., Part I. | On bedrock |
| 1314 | A | 20 0 0 | .. | .. | Wattle Flat, Dunolly | About 20 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1315 | A | 20 0 0 | .. | .. | Old Lead, Dunolly | 10–60 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1316 | A | 20 0 0 | .. | .. | Old Lead, Dunolly | 10–60 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1317 | A | 20 0 0 | .. | .. | Old Lead, Dunolly | 10–60 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1318 | A | 20 0 0 | .. | .. | Hatter's Gully, east of Old Lead, Dunolly | 10 feet | .. .. | .. | .. .. .. | W. H. Ferguson | |
| 1319 | A | 20 0 0 | .. | .. | Frenchman's Gully, ½ mile south of Burnt Creek, Dunolly | 10 feet | .. .. | .. | .. .. .. | W. H. Ferguson's Report | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1320 | A | 20 0 0 | .. | .. | Surface Hill, ¼ mile south of Burnt Creek, Dunolly | 10 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson's Report |
| 1321 | A | 20 0 0 | .. | .. | Nuggetty Gully, near Belltopper Reef, Dunolly | 8 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson's Report |
| 1322 | A | 20 0 0 | .. | .. | Baker's Gully, near Township, Moliagul .. .. | Shallow | .. | .. | .. | .. | .. | .. | W. H. Ferguson's Report |
| 1323 | A | 20 0 0 | .. | .. | Baker's Gully, near Township, Moliagul | Shallow | .. | .. | .. | .. | .. | .. | W. H. Ferguson's Report |
| 1324 | A | 20 0 0 | 17 18 0 | .. | Poseidon Lead, Tarnagulla | 71 feet | .. | .. | 24.9.1908 | Wilkins and Baker | .. | .. | A. M. Howitt |
| 1325 | A | 20 0 0 | .. | .. | Cameron's, on Burnt Creek, Dunolly | About 20 feet | .. | .. | .. | .. | .. | .. | W. H. Ferguson's Report |
| 1326 | A | 20 0 0 | .. | .. | Humbug Lead, Township of Timor | 90 feet | .. | .. | 1.6.1906 | Pollock and party | .. | .. | A. M. Howitt, Memoir No. XI. |
| 1327 | A | 20 0 0 | .. | .. | Back Creek Diggings, Talbot, Amherst | About 35 feet | .. | .. | —.2.1859 | .. | .. | .. | W. E. Adcock, "The Gold Rushes of the Fifties," p. 199 |

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No. 13.

# THE TOPOGRAPHY, GEOLOGY AND MINES OF THE WOOD'S POINT DISTRICT,

## WITH PLATES AND FIGURES

BY

O. A. L. WHITELAW,
FIELD GEOLOGIST.

(WITH PETROGRAPHICAL NOTES BY PROFESSOR E. W. SKEATS, D.Sc., A.R.C.Sc., F.G.S., Hon. Consulting Petrologist to the Survey.)




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# PREFATORY NOTES.

This report deals with the area embraced in the accompanying map, entitled the Topographical and Geological Map of the Wood's Point District. Its preparation has not been continuous owing to my having been constantly engaged in the field making geological surveys also of the Wedderburn gold-field, the Buffalo Mountains, and the Mitta Mitta tin-fields. Publications on the two former districts have already been issued, and the latter will shortly be ready for the printer. The present work is an extension of that embraced in my report published in 1905, under the title of the Wood's Point Gold-field (Memoir No. 3 of the Geological Survey of Victoria). In addition to the topographical and geological features, underground surveys have been made of all the mines embraced within the boundaries of the map, and on the underground plans and sections have been placed all the reliable data that I have obtained from personal observation and other sources.

The half-plate photographs accompanying the report were taken by my assistant, Mr. James Caldwell, Foreman Chainman, whom I have also to thank for unswerving loyalty during the carrying out of the topographical surveys in the difficult country which has been dealt with.

O. A. L. WHITELAW.

5th November, 1915.

This memoir deals with an area which in its youth as a gold-field was strikingly successful both in its alluvial and lode deposits. Decadence has been its lot for a period of twenty or thirty years. Nevertheless many of its lode mines possess undoubted promise of success in the event of a renewal of operations on an adequate scale. The Morning Star dyke, which produced over £1,000,000 of gold within 400 feet to 500 feet from the surface, is, in my opinion, one of the most conspicuous cases of a neglected mine that could be found anywhere in the Commonwealth. The territory included in the area mapped is almost barren of facilities and comfort for geological exploration, yet Mr. Whitelaw's plans and sections form one of the most striking and important pieces of geological and topographical work yet done by the State Geological Survey.

H. HERMAN,
Director.

5th November, 1915.

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NOTE.—The underground surveys (Plates XV.—XXXIII.) date to 1908.

# THE TOPOGRAPHY, GEOLOGY AND MINES OF THE WOOD'S POINT DISTRICT.

## SITUATION AND PHYSICAL FEATURES.

The area covered by the accompanying map is 277.9 square miles; it is bounded on the north by latitude 37° 28′ S., on the south by latitude 37° 40′ S., on the east by longitude 146° 35½′ E., and on the west by longitude 146° 13′ E.

The Main Divide, which parts the northern flowing waters of the Goulburn catchment area from those flowing southward to the Gippsland Lakes, traverses the area from a point 3½ miles north of the south-west corner of the sheet, for a distance of about 20 miles in a generally easterly direction; it then turns northwards, and passes through the north boundary of the block at a point nearly midway between the north-east and north-west corners. The Divide consists of folded Palæozoic strata, and bears little or no constant relation to the strike of the rocks.

The general elevation of the Main Divide varies between 3,000 feet and 4,000 feet above sea-level, the highest points determined by barometrical readings being at Mount Selma, 4,710 feet, and on the north boundary, 4,500 feet. The basalt-capped plateaux of Spring Hill and Connor's Plain are at an elevation of 4,340 feet.

The lowest gap in the Divide lies between Mount Selma and Spring Hill, the barometer recording 3,100 feet, or a general elevation of about 1,000 feet lower than the surrounding peaks. This break has been caused by a belt of black pyritiferous slates of Upper Ordovician age, which here traverses the Main Divide. At all points where these black slates outcrop at the surface, the elevation is lower than elsewhere, evidently on account of the disintegration set up by the decomposition of the pyrites, coupled with the fact that these beds have been considerably weakened by being bent over the anticlines which brought the Upper Ordovician rocks to the surface.

Practically throughout its course, the Main Divide cuts across the strike of the underlying strata at oblique angles, and, in consequence, presents considerable variation in physical features. The highest peaks usually occur at points where it is crossed by some prominent ledge of sandstone; and the saddles or declivities, where lines of dyke, anticlinal folds, or softer beds of rock have, as they cross, lent themselves more readily to the forces of denudation.

On the whole, however, the Main Divide makes an excellent travelling route, and there are few engineering difficulties in the way of the construction of a main road throughout, should circumstances ever justify it.

The width of the top of the range seldom exceeds 3 or 4 chains, but at Spring Hill and Connor's Plain exist plateaux upwards of half a mile in width, formed of the remnants of the early Tertiary basalt flows. Portions of these flows, when thoroughly decomposed, yield a deep-red chocolate soil of considerable fertility.

To the north of the Divide the map shows the head-waters of the Goulburn River and the whole of its affluent, the Black River, and to the south, portions of the Jordan and Aberfeldy Rivers (which join the Thomson), and portions of the Macalister River and its affluent, the Barkly River.

Separating the Jordan and Aberfeldy valleys is a high range known as the Mount Lookout Range; and between the Aberfeldy and Macalister Rivers is the Mount Useful Range.

The general difference of level between the rivers and the main ranges and spurs varies between 2,000 feet and 3,000 feet. The lowest recorded level is at the junction of the Barkly and Macalister Rivers, the barometer registering 900 feet above the sea.

The denudation of areas occupied by contorted Lower Palæozoic and more nearly horizontal Upper Palæozoic rocks gives two distinct types of scenery. In the former the spurs fall at high angles into wedge-shaped valleys, while in the latter the valleys are much broader and are flanked by flat-topped ranges, whose sides are almost vertical acclivities, ranging from 100 feet to upwards of 1,000 feet in height. (See Pl. VII., Figs. 1 and 2; Pl. XIII., Fig. 1.)

It is evident from the high elevation of beds of Upper Palæozoic and Jurassic age, that subsequent to their deposition the whole of the highlands of eastern central Victoria (Gippsland) have been raised several thousand feet above their original positions. Possibly this uplift continued into Lower Tertiary times, and accounts for the presence of the lava-covered river gravels of Spring Hill, Connor's Plain, Dargo High Plains, &c. (Pl. IX., Fig. 2.) The broad valleys cut out by these early Tertiary streams indicate that the physical conditions then prevailing must have resembled those now obtaining on the basalt plateaux.

In fact, the evidence that the Lower Tertiary river gravels were raised to their present position by uplift does not appear to me to be conclusive. From the field relations, the basalt would appear to have been ejected at widely separated

localities, and to have choked back the waters of the valleys adjacent to the points of eruption. Had these small areas been raised to their present position by uplift, they could scarcely have controlled the drainage system of several fairly large rivers, as a study of the geological map shows them to have done. The existing lines of drainage have all been determined since the outflow of basalt. The valleys are all V-shaped, and, judging by their direct courses, the absence of meanders in the valleys and of accumulations of wash removed from the beds of the streams, denudation has proceeded uninterruptedly since early Tertiary times.

No settlement exists over this area with the exception of the small township of Wood's Point, lying at the head of the Goulburn River, at an elevation of 2,245 feet; Matlock, on the crest of the Main Divide, at an elevation of 4,000 feet; and the hamlets of Jericho and Red Jacket, on the Jordan River, 1,840 feet and 1,715 feet respectively above sea level; all of these are mining centres in the south-western corner of the surveyed area.

Except where denuded for mining purposes, timber is abundant over the whole country. On the more open ranges grow white gum, peppermint and stringybark, from 1 foot to 4 or 5 feet in diameter, and averaging 60 feet or 70 feet high. At the heads of gullies, especially those with a southern aspect, are considerable forests of mountain ash of excellent quality, which often attains a height of 200 feet and a girth of 20 feet to 25 feet. Messmate is common at elevations between 3,000 feet and 4,000 feet, and much of it is of first-class quality. The highest ranges and peaks are clothed with small, tenaceous snow-gums (Pl. III., Fig. 2), and nearly all the streams and gullies are a tangled mass of tree-fern and other ferns, hazel, musk, sassafras, blanket wood, dogwood, lightwood, blackwood, and wattle of numerous varieties.

In consequence of its mountainous nature and the rapidly-flowing streams, denudation of the rocks produces little soil *in situ*, and the country is fitted only for rough grazing. Small flats, which seldom reach an acre in extent, are occasionally cultivated on some of the streams adjacent to settlement.

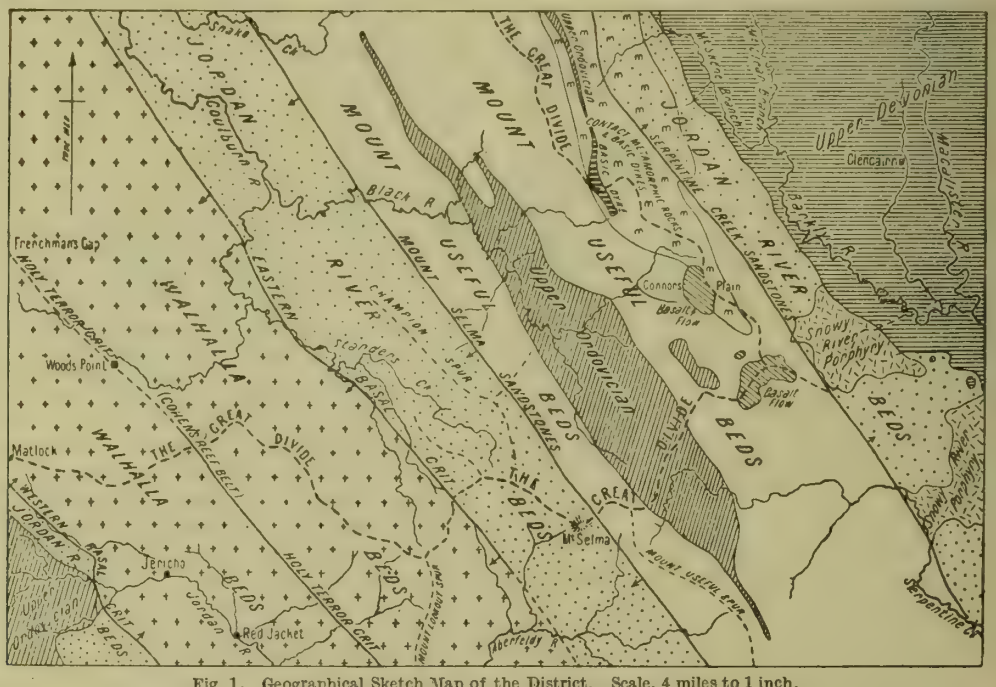
In the Macalister River valley the country is more undulating and open, and is comparatively free from undergrowth. The prevalent timber is box and stringybark. The greater portion of this area is good grazing land, but is handicapped in the drier months of the year by the rapid disappearance of the water through the flat-bedded Upper Palæozoic rocks. The basaltic plateaux of Spring Hill and Connor's Plain (Pl. VII., Fig. 1) yield a few acres of very rich soil, but their high elevation permits their use for grazing purposes for only a few months of the year.

## GEOLOGY.

### THE STRATIGRAPHICAL SUCCESSION.

In Memoir No. 3, the Wood's Point Gold-field,[1] the stratigraphical succession of the Lower Palæozoic beds is given as Lower Ordovician, Ordovician, and Silurian, but the more extended field of observation covered by the present survey, together with the subsequent palæontological determinations of specimens by Mr. Frederick Chapman, A.L.S., and Dr. T. S. Hall, M.A., D.Sc., has necessitated considerable modification in the classification of the lowest and contorted members of the group.

The geological sequence in ascending order appears to be as follows:—Lower Palæozoic: 1. the Upper Ordovician; 2, the (?) Lower Silurian (the Mount Useful series); 3, the Upper Silurian, subdivided into two groups—(*a*) the Jordan River series and (*b*) the Walhalla series.


JORDAN
Goulburn R.
MOUNT
THE GREAT DIVIDE
MOUNT USEFUL
Black R.
RIVER
Champion
Spur
Basal Grit
Sandstones
Upper Ordovician
Basalt Flow
Connors Plain
Basalt Flow
JORDAN RIVER SERIES
Snowy River Porphyry
Devonian
Upper
Glencairn
Wadsleys Cap
Serpentine
Frenchmans Cap
Woods Point
WALHALLA
Eastern
Holy Terror Creek
Matlock
Jericho
Red Jacket
Western Jordan R.
Basal Grit
Upper Ordovician
Mount Useful Spur
Mount Useful Creek
Basal Grit
Sandstones
Upper Ordovician
Basalt Flow
Mt Selma

dykes; and 3, basaltic dykes. The Upper Palæozoic rocks have been invaded only by the basalt dykes.

The final stage of the intrusion of basalts has led to the production of small flows, remnants of which occur at Spring Hill and Connor's Plain. In each instance the basaltic flow has been discharged in, or close to, a river bed, the fluviatile deposits of which have been preserved from denudation by the solidified cap of lava.

The denudation of the older rocks has provided the material forming the high and low level gravels flanking the larger water-courses and the alluvial material of the flats.

Regional metamorphism has been developed in the Lower Palæozoic rocks from the eastern edge of the Walhalla series, east, until the Lower Palæozoic group of rocks is lost under the covering of Upper Palæozoic.

Contact metamorphism is strongly in evidence in the area surrounding, and north of, Connor's Plain. This is the area traversed by the intrusive green basic dykes.

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### Upper Ordovician.

The Upper Ordovician rocks are well developed on the western side of the area in the valley of the head-waters of the Jordan River and towards the eastern side of the area, in the Black River, the creeks of the Barkly River watershed, and the Serpentine Creek. They consist almost entirely of black shales and slates, with some small bands of rock with a very low specific gravity, apparently interbedded volcanic ash. Occasional bars of dark, flinty sandstone also occur.

The dark colour of the beds is no doubt due to carbon, which is probably organically derived as the beds are very rich in various species of graptolites. A typical specimen of black slate from the Main Divide, near Mt. Selma, was found to contain about 4.4 per cent. of carbonaceous matter and 0.8 per cent. of water. The specimen was assayed, and was found to contain neither gold nor silver.

Fossils were probably equally distributed over the western and eastern areas, but in the latter schistosity has been developed to so great a degree (Pl. III., Fig. 1) that complete specimens can be obtained only where cleavage and bedding are parallel. Graptolites may be collected over almost any portion of the western Upper Ordovician area. Fossils from both the eastern and western areas were submitted for examination.

The following graptolites discovered during the survey in the Upper Ordovician rocks have been identified by Dr. T. S Hall, M.A., D.Sc., Melbourne University.[1] For further notes on these fossils the reports mentioned in the footnote should be consulted:—

| —— | 1. | 2. | 3. | 4. |
|---|---|---|---|---|
| *Climacograptus bicornis*, J. Hall | .. | .. | × | .. |
| *C. bicornis* var. *peltifer*, Lapw. | .. | .. | × | .. |
| *C. hastatus*, T. S. Hall | .. | × | .. | .. |
| *C.* cf. *innotatus*, Nich. | .. | × | .. | .. |
| *C. tubuliferus*, Lapw. | .. | × | .. | .. |
| *C.* sp. | .. | × | × | ? |
| *Cryptograptus tricornis*, Carr. | .. | .. | × | .. |
| *Dendrograptus* sp. | .. | ? | .. | .. |
| *Dicellograptus affinis*, T. S. Hall | .. | × | .. | .. |
| *D. elegans*, Carr. | .. | .. | × | .. |
| *D. morrissii*, Hopk. | ? | .. | .. | .. |
| *D. sextans*, J. Hall | .. | .. | × | .. |
| *D.* sp. | .. | × | × | .. |
| *Dicranograptus furcatus*, J. Hall | .. | .. | × | .. |
| *D. nicholsoni*, Hopk. | .. | .. | × | × |
| *D. ramosus*, J. Hall | .. | .. | × | .. |
| *D. ramosus* var. *longicaulis*, Elles and Wood | .. | .. | × | .. |
| *D.* sp. | .. | .. | × | .. |
| *Diplograptus calcaratus*, Lapw. | .. | .. | × | .. |
| *D. foliaceus*, Murch. | × | × | .. | .. |
| *D.* cf. *foliaceus*, Murch. | .. | × | .. | .. |
| *D.* cf. *tamariscus*, Nich. | .. | × | × | .. |
| *D. tardus*, T. S. Hall | .. | .. | × | × |
| *D.* sp. | .. | × | × | .. |
| *Diplograptus* (*Idiograptus*) sp. | ? | .. | .. | .. |
| *Glossograptus* cf. *hermani*, T. S. Hall | .. | .. | × | .. |

1. From 1½ miles south-west of Kelly's Hill, near Matlook. 2. Yarra Track, 1½ miles south-west of Kelly's Hill. 3. Jordan River, 2½ miles above Jericho. 4. Little Jordan Creek, 50 chains above junction with Jordan River.

*Diplograptus* sp. has been identified from the Wood's Point company's tunnel, Wood's Point; from No. 10 Spur, between Spring Hill and Mt. Selma; and from No. 12 Blaze, Main Divide.

*Dendrograptus* (?) or *Dictyonema* (?), at the junction of Stander's Creek with the Goulburn.

*Diplograptus* sp. cf. *murchisoni* and *Climacograptus* spp., at Black River, near the junction of Ten-mile Creek.

The black slates are highly charged with iron pyrites, the decomposition of which has yielded numerous gossan lodes and has caused areas surrounding springs or stagnant water to be coated with deposits of hydrous oxide of iron. An assay of gossan from between the One and Two Mile trees, near Spring Hill, on the Main Divide, showed no gold or silver. Quartz reefs are well defined and numerous, but none have proved auriferous.

Turquoise veins will possibly be located by prospecting, since veins of white material suggestive of the occurrence of turquoise have been observed in this area. Turquoise veins have been worked in black slates of Upper Ordovician age in the Edi district, about 60 miles to the north.

The Ordovician rocks occupy only limited areas, and in each instance have been brought to the surface on dome-shaped folds, which pitch away north and south under the younger sediments.

On the western area, overlap appears to occur, bringing the upper series of the Silurian into contact with the Ordovician. North of the line of stratigraphical section, however, in the valley of the Big River, the beds are seen in their true order of succession, the typical pink and green slates of the Lower Silurian resting on the black slates of the Ordovician.

In the eastern area the elliptical outcrops of the Ordovician are surrounded on all sides by the green schistose representatives of the Lower Silurian.

[1] Rec. Geol. Surv., Vict., Vol. I., Pt. 1, p. 35; *Ibid.* Pt. 3, pp. 219, 221; *Ibid.*, Pt. 4, p. 271; *Ibid.*, Vol. II., Pt. 2, pp. 138, 139.

### Silurian.

The Silurian group appears to attain its greatest thickness, upwards of 11,000 feet, along the main synclinals. It is interesting to note that, in his remarks on some plant-remains collected from beds in the highest zone of the main synclinal, Mr. F. Chapman says: "Horizon doubtful, but probably Lower Carboniferous," and that the fossils closely resemble some plant-remains from the Avon River sandstones. From the field relations of these beds I am satisfied that the fossils submitted came from the highest beds of the Walhalla series, but their high range is indicated by Mr. Chapman's determination.

#### Mt. Useful Beds (? Lower Silurian).

It is not absolutely clear whether the widely-distributed beds classed under this heading should be assigned a position at the base of the Silurian or at the top of the Upper Ordovician. Only a few fragmentary fossils have been discovered in them, whereas the underlying black slates of the Upper Ordovician are rich in graptolites, and the overlying members of the Silurian in mollusca, corals, and trilobites. Specimens were examined by Mr. F. Chapman, A.L.S., who recognised some (?) monticuliporoids and other obscure organic remains from Lazarini's Spur, and some graptolitic like bands and patches of (?) organic (fucoidal) structures from the west side of the Barkly River above Crescent Creek.

The representatives of this group are highly coloured, and consist for the most part of argillaceous sediments, yellow, purple, greenish, or earthy black in colour. A few sandstone bars and some crushed conglomerate also occur.

Along the western outcropping areas the beds are in a normal condition, but those of the eastern have been considerably metamorphosed and converted to a phyllitic or schistose condition with well-developed cleavage. As a result of this cleavage, the beds in proximity to the synclinal folds frequently stand above the surface as buttresses of rock 20 feet or 30 feet in height (Pl. IV., Fig. 1). Through these the bedding planes can be traced as lines of colour, usually inclined at low angles to the almost vertical cleavage planes.

Though quartz veins are numerous, prospecting has revealed very little gold, but the Mount Selma and Union Jack reefs carry a little. These reefs appear to be in the highest zone and close to the contact of the Middle Silurian.

In the Jamieson River to the north of the surveyed area, however, a quicksilver (mercury) lode has been worked in beds which undoubtedly belong to this series, and there is no reason why further discoveries should not be made in the areas under review.

#### Jordan River Beds (Upper Silurian).

The beds of this group are well represented both on the western and on the eastern wings of the geosynclinal fold. On the western side they are well developed on the Jordan River, and on the eastern at Stander's Creek. Further east they occur again on the eastern side of the geanticline. The rocks are composed of yellow mudstone and clay-slates, with occasional sandstone bars, conglomerates and associated ash beds (Pl. IV., Fig. 2).

On the western side the beds are normal, but on the eastern they have been regionally metamorphosed, and the resultant cleavage renders it difficult to obtain good fossils. A few brachiopods only were obtained on this side.

On the western side, however, in beds cutting across the head waters of the Jordan River, fossils are fairly abundant, and numerous brachiopods (inclusive of the large shell *Panenka gippslandica*) and cephalopods were submitted to Mr. Chapman for determination, with the following results:—

Shale from the spur between the Jordan River and B.B. Creek:—*Panenka gippslandica* McCoy sp., *Panenka* sp. (? *P. gippslandica*, juv.), (?) *Paracardium, Actinopteria* sp., *Tentaculites matlockiensis* Chapm., *Styliola fissurella* J. Hall, var. *multistriata* Chapm., (?) *Orthoceras, Ceratiocaris* sp.; also a pelecypod, indet., and numerous tracks in all probability due to crustacea.

From Stander's Creek:—*Favosites* sp., (?) *Lindstrœmia, Orthoceras;* also monticuliporoids, crinoid remains, brachiopods and (?) plant remains.

Shale, 1½ m. S.W. of Kelly's Hill, Yarra track, just outside the western boundary of the map:—*Pleurotomaria* sp., *Cycloceras tenuiannulatum* McCoy, var. *australis,* Chapm.

Auriferous reefs and dykes have been worked in beds of this age, but they do not appear to have been nearly so productive of gold as the Walhalla series.

#### Walhalla Beds (Upper Silurian).

The series embraced under this heading is of particular importance, as probably 90 per cent. of the gold won from the Walhalla-Wood's Point mining belt has been obtained in dykes and reefs occupying fissures in these rocks.

As will be seen from the stratigraphical section, these beds form the uppermost portion of the Silurian system. They have been lowered to considerable depths in the two main synclinal troughs that traverse the area in a north-westerly and south-easterly direction. Beds of this age may be traced continuously from the Tertiaries south of Walhalla north-west to the Carboniferous rocks of Mansfield, a distance of over 60 miles. The average width of the belt is about 6½ miles.

At the base of the series is a conglomerate composed of cemented angular and rounded fragments of the older rocks and small rounded pebbles of quartz. Lenticles and vughs of limestone are commonly associated with this conglomerate.

The basal conglomerate outcrops on both sides of the synclinal trough, that on the western being traceable from the copper mine south of Walhalla, north-westerly to the west of Mount Lookout, across the head waters of the Jordan River, passing Mount Matlock to the west and continuing down the watershed of the Big River to the east of Enoch's Point township and on to the Goulburn River to the east of Darlingford (see Fig. 5).

The eastern band is also continuous from the limestone (marble) quarries of Deep Creek, near Walhalla, through Donnelly's Creek, Aberfeldy River, over Mount Stander and down the western side of the Goulburn River to Moat's Creek and Jamieson.

It is probable that these two conglomerates are outcropping portions of the same bed on opposing sides of the syncline.

The beds above the conglomerate are coarser than those of the Lower Silurian series, and consist of sandstones, shelly sandstones, quartzose sandstones, grits and fragmentary beds, with a lesser percentage of shaly slates and variegated mudstones.

The series generally is rich in fossils, but they are practically confined to the coarser beds, and in consequence are very fragmentary.

Numerous specimens, submitted to Mr. Chapman at various times for examination, have been determined, and show that the Walhalla beds are very high in the Silurian system, some, in fact, exhibiting a Devonian facies.

Sandstone from first gully E. of Argyle mine, Jordan River:—brachiopod fragments and other indeterminable fossils.

From near the Jordan River on the S. boundary of the map, 3 miles E. of the S.W. corner:—coral fragments, crinoid remains, casts of brachiopods and crustacean fragments; none determinate.

Felspathic sandstone, Morning Star Creek and Goulburn River:—(?) *Camarotœchia,* and remains of indeterminate crinoids and brachiopods.

Shale, Stackpoole's house, Wood's Point, 15 chains below the junction of Morning Star Creek and Goulburn River; this rock is literally crowded with casts of an indeterminate species of *Orthoceras,* with occasional impressions of the same fossil—cf. *Orthoceras* (*Protobactrites*) *baculiforme* Salter, or *O. lineare,* Münster sp.

Felspathic sandstone, Goulburn River, Wood's Point township: — *Haliserites* and monticuliporoids.

Shale from Perkins' Creek and Goulburn River, Wood's Point:—impression of an (?) *Orthoceras,* and (?) *Haliserites.*

Shaly rock, Goulburn River, Wood's Point:—*Haliserites Dechenianus,* Göppert.

Fine felspathic sandstone from Matlock-road, near Big Comet shaft, Wood's Point:—*Haliserites Dechenianus,* Göppert.

Grit, Gooley's Creek, above the Shamrock mine, Wood's Point:—crinoid stems and plates and brachiopod remains, indeterminate.

Gooley's Creek, near Little Comet mine, Wood's Point:—(?) *Orthoceras* and obscure fossil remains.

Grit, behind Mullani's house, 20 chains N.E. of the junction of Perkins' Creek and the Goulburn River near Wood's Point:—(?) *Diamespora,* (?) *Camarotœchia,* crinoid remains, a nodulose monticuliporoid and small corals or polyzoa.

## Upper Palæozoic.

### VOLCANIC.

These rocks occupy scattered areas along the contact of the Upper and Lower Palæozoic rocks.

The formation is probably only slightly antecedent in age to the Upper Palæozoic sedimentary beds, and it forms the foundation upon which those rocks have been deposited.

The rock mass consists of quartz and felspar porphyry and beds of agglomerate. It attains its maximum thickness of about 1,000 feet in the valley of Serpentine Creek. The whole mass is apparently part of the extensive Devonian volcanic series which stretched from this point eastward to the Snowy River. (Pl. VI., Fig. 1.)

The rock is hard, compact, and variegated in colour, and would no doubt be of value as a building or monumental stone, if more accessible to the commercial centres.

Fibrous hornblende (asbestos) frequently occurs in vughs in the porphyry, but, considering the hardness of the rock, not in sufficient quantities to be of commercial value.

At the base of the porphyry, and only in areas occupied by that rock, are several isolated outcrops of limestone. The largest area would not exceed a quarter of an acre, with a maximum thickness of 20 feet. The limestone is hard, blue, and crystalline, and probably of inorganic origin. From its constant position at the base of the porphyry flows, it seems probable that it has been derived from chemical precipitation, into hollows, of lime derived from the decomposition of the felspars and other minerals in the porphyry. An analysis of a specimen of this limestone from Lower Serpentine Creek was made in the Geological Laboratory with the following results (No. 77):—

| | | % | |
|---|---|---|---|
| Insoluble | .. | 20.17 | |
| $Al_2O_3$ .. | .. | 1.55 | |
| $Fe_2O_3$ .. | .. | | |
| $CaCO_3$.. | .. | 75.37 | (CaO 42.21%) |
| $H_2O(110°)$ | .. | 0.36 | |
| | | 97.45 | |

### SEDIMENTARY.

The largest area of Upper Palæozoic sedimentary rocks is the belt occupying the valleys of the Macalister, Wellington, and Avon Rivers, the western portion of which is shown on the map. The junction of these beds with the Older Palæozoic rocks is well exposed in numerous sections along the cliffs immediately fronting the Barkly River, where they rest in strong unconformity on the upturned edges of the Silurians or on the underlying porphyry lava flows. (Pl. VI., Fig. 2.)

The basal member of the group is a coarse, red conglomerate composed of fragments of its own re-cemented material, angular and abraded pebbles of the Older Palæozoic beds, and rounded pebbles of porphyry and quartz. The conglomerate is succeeded by shales, sandstones, and minor conglomerates, the whole of distinctive purple and red colours. Occasional shale bands are olive green.

The palæontological evidence which has been collected at various times, and over various parts, indicates the fresh water or lacustrine origin of the group. Some fragmentary fossils were obtained in the basal beds immediately below the junction of the Mount Skene and Mount Clear branches of the Barkly River, and were examined by Mr. F. Chapman, who considers them to be remains of (?) fucoids. He remarks that these rocks are comparable with the Carboniferous series of the Broken and Delatite Rivers.[1]

Probably the whole of these rocks shown on the map are the lowermost portion of the Upper Devonian or Lower Carboniferous beds. They dip away at low angles in a general south-easterly direction under the Avon River beds.

The maximum thickness shown in the section is about 2,000 feet. Along the western contact with the older rocks, the basal beds are much broken and faulted, and dip at all angles up to vertical. Elsewhere, however, the Upper Palæozoic beds are bent into a series of wide, flat folds, the dips varying between 5° and 30°, with a prevalent pitch to the south-east.

[1] Rec. Geol. Surv. Vict., Vol. II., rt. 4, p. 208.

A noticeable feature in connexion with the Upper Devonian sedimentary rocks is the manner in which the meteoric waters escape during the summer months. Streams like the Barkly River, when running over Silurian or Ordovician rocks, have a fairly even flow of water, but this becomes noticeably less when the stream traverses Upper Devonian rocks. It is highly probable that the coarse sandstones and conglomerates, which form beds several hundreds of feet thick, absorb large quantities of water, which escapes seawards above the impermeable shales. It is quite possible, therefore, that artesian water may be tapped by boring these beds slightly north of where they disappear under the fertile Tertiaries of Gippsland.

No minerals of commercial value have been obtained in the Upper Palæozoic rocks, but it is possible that phosphatic beds may exist, since phosphatic deposits have been found[1] in beds of the same series near Mansfield. Among the decomposing Upper Palæozoic rocks of this area are numerous "salt licks," where native animals have resorted for salt. A specimen from one of the "licks" at Glencairn Creek examined at the Laboratory was found to contain only a very small portion of material soluble in water; this consisted of common salt (about 0.3 per cent. of the whole sample) and a small amount of sulphate. (Pl. VIII., Fig. 2.)

## Miocene.

### GRAVELS.

The isolated areas of sub-basaltic river or lacustrine gravels indicated on the map are, no doubt, contemporaneous with the much larger areas found at the Dargo High Plains and numerous other elevated portions of Gippsland. The Dargo deposits contain fossil leaves believed to be Miocene, but no fossils have been found in the beds here dealt with. Their position on what now constitutes the Main Divide of the State, high above the neighbouring valleys, indicates the amount of uninterrupted denudation which has proceeded throughout this portion of Victoria during Tertiary times—a period of freedom from plication, the more remarkable when it is considered that beds assigned to the same age have been folded into high parts of the European Alps.

The base of the wash on Connor's Plain is at a slightly higher elevation than that of Spring Hill, the lowest recorded barometric level in the former instance being 4,185 feet, and in the latter 4,165 feet. The two deposits evidently represent portions of two separate watercourses that junctioned over the head of the Black River at no great distance west of Connor's Plain.

In composition, the gravels do not differ greatly from those of the existing streams, but they carry a greater percentage of siliceous cementing material, probably due to a chemical rearrangement of some of the siliceous particles forming the sandstone pebbles. In places the gravels lie in a loose drift of fine sand, but in others have been cemented into a very hard conglomerate by silica leached from the rocks and redeposited, or as the result of the action of solutions which were the first product of the volcanic energy that gave rise to the overlying lava flows. (Pl. IX., Fig. 1.)

A considerable amount of prospecting for alluvial gold has been undertaken, both at Spring Hill and at Connor's Plain. On the western side of the latter Mr. Thomas Hoskins sank several shafts and drove a small adit, now collapsed. I have tested the material at several points, but could obtain only fine colours of gold. The evidence, both from the washes themselves and from the gullies cutting across them, is not favorable to the existence of payable auriferous deposits.

[1] The beds referred to are at Mount Battery and Broken River, at Barwite. No report has been issued concerning them; the records are in the Department. They were found by Mr. A. M. Howitt Field Geologist.

### THE OLDER BASALTS.

Small pipes of intrusive basalt occur in widely separated parts of the area. One just outside the western boundary of the map has been described by Professor J. W. Gregory[1] as a fine-grained olivine basalt, consisting of labradorite, olivine, pyroxene, magnetite and apatite, with a specific gravity of 3.03. A small, similar outcrop can be seen at the head of Blue Jacket Creek. Both are intrusive into the Lower Palæozoic rocks, while a small group of pipes which have invaded the Upper Palæozoic measures occur at Mount Lookout (Macalister River), in the north-east corner of the area. No flows accompany these intrusions.

At Connor's Plain (Pl. IX., Fig. 2) and Spring Hill, however, the Main Divide is capped by lava flows, in the former place to the extent of upwards of 300 acres, and in the latter of 400 acres.

The basalt at these localities varies considerably in coarseness. At Connor's Plain a coarsely crystalline variety with long prisms of felspar occupies an elongated portion of the northern area, while the surrounding basalt is more compact.

On Spring Hill, the coarse variety occupies the eastern end of the outcrop, while in its centre is a dense aphanitic rock. Surrounding the coarse rock is a compact basalt similar to that of Connor's Plain. It is probable that the coarsely crystalline variety marks the position of the vents from

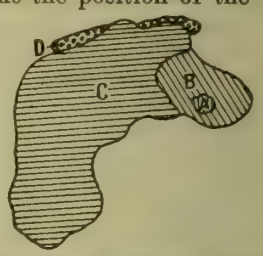



Fig. 2.—Plan of Spring Hill Plateau, showing (A) aphanatic (B) coarse and (C) compact basalts, overlying (D) river gravels.
Scale: 1 mile to 1 inch.

which the flows emanated. The local evidence does not indicate that the flows covered any widespread area. Had they been outliers severed by denudation from some large flow, the surrounding valleys would have carried a much greater proportion of basalt wash than is the case.

The maximum thickness of the basalt capping does not greatly exceed 100 feet, and underlying considerable portions of it are the Miocene river gravels.

## Post-Pliocene.

Embraced under this heading are the high-level gravels that flank the valleys of the larger existing watercourses. The material composing them consists of the water-worn gravels abraded from the various rocks in which the valleys have been formed. (Pl. X., Figs. 1 and 2.) The component parts of the wash are usually loosely cemented together.

The highest level gravel of this area is that of Glencairn Creek valley (Pl. XI., Fig. 2); this is a continuous deposit, and undoubtedly represents a portion of the ancient valley formerly occupied by the Macalister River when that

[1] The Wood's Point Gold-field, by O. A. L. Whitelaw, Mem. No. 3, Geol. Surv., Vict., 1905, p. 34.

stream flowed at an elevation of about 500 feet above its present bed. The change is best explained with the aid of Fig. 3 and Pl. XI., Fig. 1. In the photograph, Glencairn valley is in the extreme left of the picture. In the background are the two branches of the Macalister River, the right-hand branch being known as the Caledonia River. Between these streams is the serrated range known as Bennison's Spur, which, in late Tertiary times, was unquestionably connected with the range (Bald Hill Spur) from which the photograph was taken. The Macalister River at that time flowed through what is now Glencairn valley, and the Caledonia River occupied a higher position over what is now the main Macalister River valley. Probably as the result of a landslip (to which the flat-bedded Upper Palæozoic rocks are peculiarly liable), the Macalister waters were diverted into those of the Caledonia.

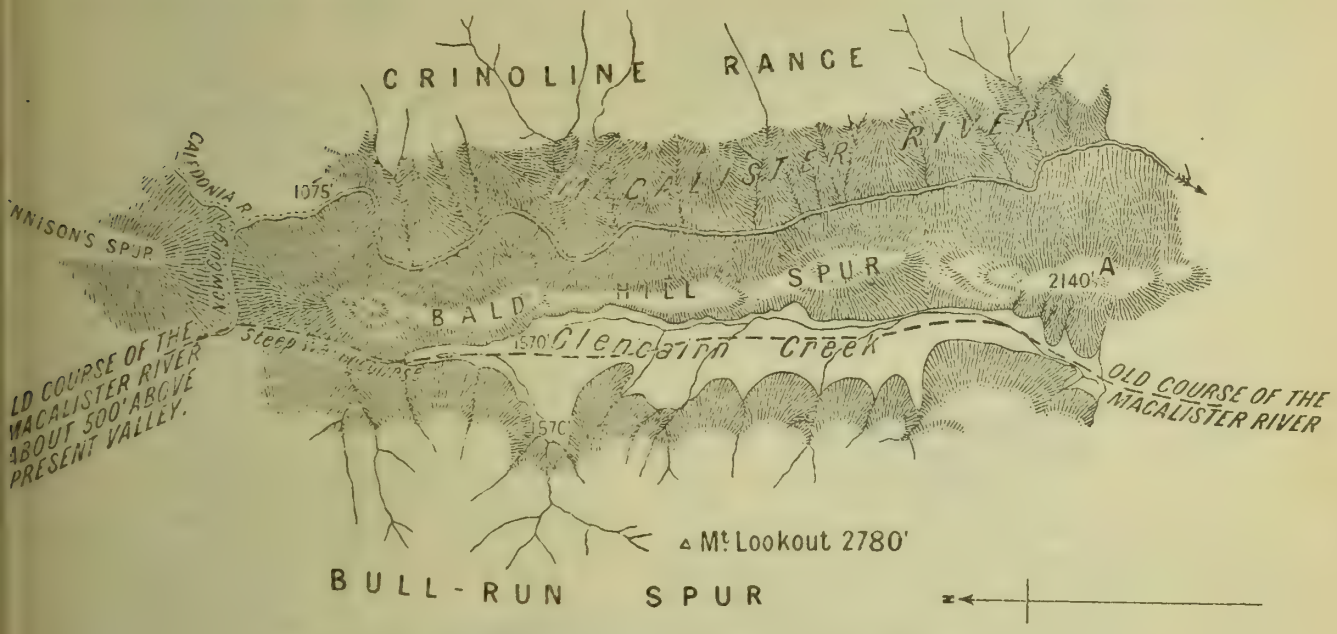



FIG. 3. Map illustrating the old and new courses of the Macalister River.
The photograph, Plate XI., was taken at the position marked A, looking north. Scale: 1 mile to 1 inch.

Where crossing the auriferous belts, the high-level gravels have proven equally as rich in alluvial gold as the existing valleys, and in the Jordan and Goulburn Rivers and Red Jacket Creek extensive deposits have been worked by hydraulic sluicing. (Pl. X., Fig. 2.)

### Recent Alluvium.

The mountainous nature of the whole of the surveyed area and the steep gradients of the main valleys have prevented the formation of any extensive deposits of alluvium. Except along the Macalister River, such deposits do not exceed an acre in extent. The alluvial consists entirely of material derived from the destruction of the older rocks. Practically all the watercourses of any magnitude which cut into, or through, the main auriferous belt have carried payable alluvial gold, and some of these (particularly B. B. Creek, Red Jacket Creek, and the Jordan River) have been extremely rich. B. B. Creek is believed to have been the richest alluvial lead in Gippsland, and it is said that there was not one poor claim in the whole of its length. The only streams that carried alluvial gold without having their source in the main auriferous belt are the Aberfeldy River, Stander's Creek, and Crescent Creek. The latter runs into the Barkly River, and is the only place where alluvial gold has been obtained in the Macalister valley. A few ounces only were won in this creek by Mr. Charles Sweetapple and others, but the discovery is encouraging, since it indicates that the lodes or reefs of the locality are worth prospecting. By consulting the map it will be seen that Crescent Creek is almost confined to the porphyry rocks, but that a small inlier of Silurian rocks occurs near the junction of the main branches. This inlier should be investigated as the source of the alluvial gold.

## TECTONIC FEATURES.

### FOLDING.

Folding, induced by east and west and to a lesser degree by north and south pressures, has been extreme throughout the whole group of Lower Palæozoic sediments, and appears to be equally developed throughout the entire range of formations from the Walhalla series to the Upper Ordovician.

The main lines of anticlinal curvature run along those areas where the Upper Ordovician rocks outcrop at the surface, as evidenced on the Jordan River near the western boundary of the survey, and in the headwaters of the Black River. Two main synclinal troughs cross the line of section at 4¾ miles and 8¼ miles respectively from the south-west corner of the area surveyed.

The axial lines seldom lie in a horizontal plane, but are inclined at various angles north or south along their strike. As a rule the pitch in either direction does not exceed 25°, although at places where a considerable amount of contortion has occurred in association with the folding, it is almost vertical.

As far as the area under consideration is concerned, the pitches in either direction appear to compensate one another, and thus the general average thickness of the beds indicated on the stratigraphical section is probably maintained throughout.

The Jordan River and Black River main anticlinals are distinctly dome-shaped, and the Ordovician beds are, in consequence, inclined in the four cardinal directions under the overlying Silurian rocks.

Monoclinal folds are common, and excellent examples are to be seen in various natural sections, particularly in the beds descending to the main syncline.

In the Upper Palæozoic rocks some slight wave-like folding has been induced. The strike of the folds appears to approximate to that of the older rocks, but the dip of the legs is at low angles, varying between 5° and 30° from the horizontal.

### STRIKE AND DIP.

When traced throughout the area, the lines of strike of the Palæozoic formations are found to maintain a fairly uniform north-west and south-east trend; but, over small areas, considerable

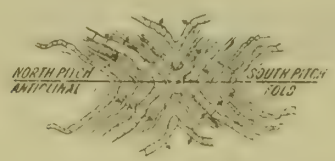



FIG. 4. Diagram illustrating change of strike consequent on change of pitch.

local variability may occur, particularly near where the pitch changes in direction. This condition frequently gives a false impression of faulting.

To rectify such local variations, and also to ascertain correctly any permanent alteration of strike lines, I recognised at the beginning of the survey that it was essential to carefully work out in the field the prominent recognisable beds, such as the conglomerates, grits and sandstones, if the various auriferous and barren belts were to be shown in their true sequence. On the map are shown various beds which I have termed respectively the Serpentine Creek sandstones (Pl. V., Fig. 2), the Mount Selma sandstones, the Eastern basal grit and conglomerate, the Holy Terror grit, and the Western basal grit and conglomerate (Fig. 1).

The Serpentine Creek and Mount Selma sandstones are distinctive bands of sandstone, grit and crushed conglomerate (Pl. IV., Fig. 1), which, I believe, separate the Jordan River beds from the Mt. Useful beds. The Eastern and Western basal grits separate the Jordan River beds from the Walhalla beds.

The Holy Terror grit is a fossiliferous bed of rock occurring in the Walhalla series, and, in my opinion, is identical with a similar band to the east of the Long Tunnel and Anderson's lines of reef. By reference to the map, it will be seen that nearly all the main lines of auriferous reefs and dykes in the Wood's Point district are in that portion of the Walhalla rocks which lies between the Holy Terror grit and the Walhalla geosyncline.

Dip ranges through all angles between horizontal and vertical, according to its proximity to the

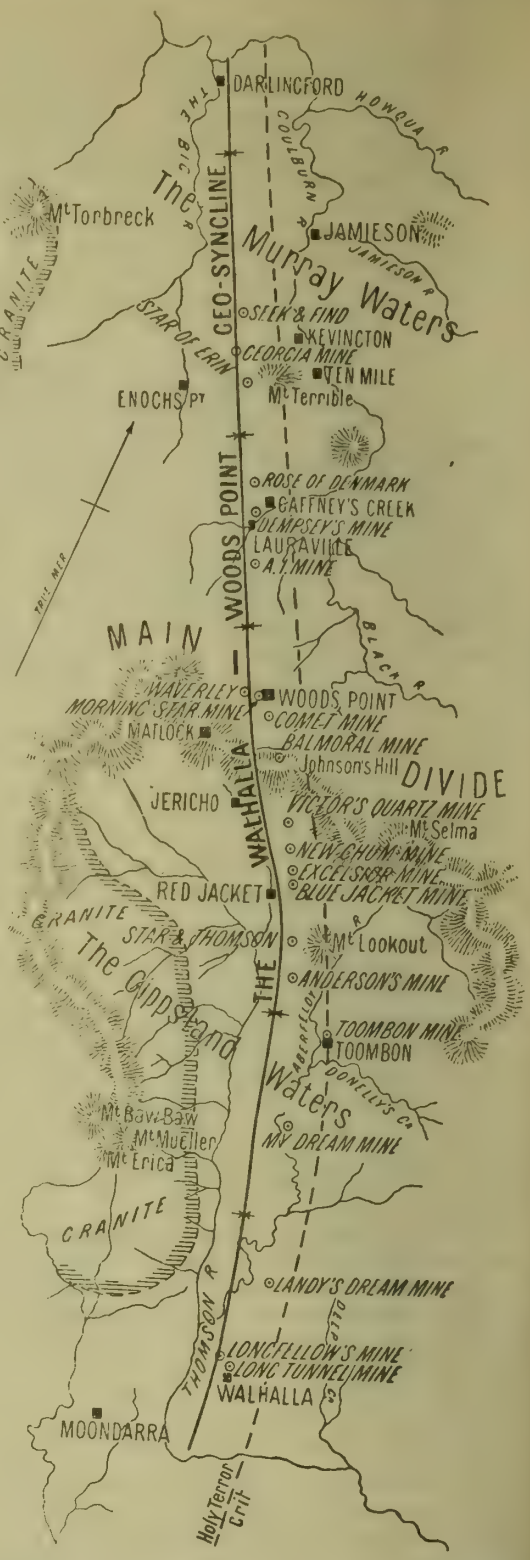



FIG. 5. Sketch map illustrating the relative positions of the principal mines and the Walhalla-Wood's Point geosyncline. Scale, 8 miles to 1 inch.

nearest fold. It is not always equal on both sides of a fold, the greatest variation occurring in association with the monoclines.

### CLEAVAGE.

Cleavage is not very noticeable in the beds occupying the western portion of the surveyed area, but gradually becomes more pronounced

towards the east, and is an outstanding feature in the argillites, phyllites and schistose rocks of the central and eastern area.

The strike of the cleavage planes is generally coincident with that of the bedding, except where the beds are about to fold over or under the anticlinal or synclinal axes; in such positions cleavage and bedding cut each other at angles dependent on the pitch of the folds. The average dip of the cleavage planes is 85° W. and at such points as it appears to be less than this angle, it may safely be assumed to be due to faulting or to surface disarrangement.

### JOINTING.

Jointing of the rocks is not, generally speaking, a prominent feature, nor does it extend over any large continuous area. It is particularly noticeable in the coarser beds of sandstone and grit, and in these rocks it forms the channels along which numerous quartz reefs and veins have been deposited. Many reefs so formed have been worked for gold, and are locally known as "sandstone dykes."

Radial fissuring or jointing is common in the crowns of anticlinal folds, and is particularly noticeable when the folded beds are of coarse texture.

In the larger dykes, a regular system of jointing has been induced by the shrinkage of the dyke during cooling and drying, and it is along these joints that the quartz reefs and veins, which form such a prominent feature in Wood's Point mining, have been deposited.

The jointing is generally prismatic, the main lines running at angles of approximately 45° to the beds that bound the jointed rock.

### FAULTS.

Faulting may occur to a much greater extent than is apparent to the eye, but in such natural sections as exist in the field, or in the sections exposed in the mine workings, there is not, as a rule, much evidence of displacement, more particularly in a direction transverse to the strike of the beds. The greatest lateral heave observed is in the All Nations mine, where the May Moon dyke is displaced for about 100 feet. At the Waverley mine the dyke has been faulted for 20 feet. In connexion with the large dyke-bulges, minor displacement can often be observed at the points where the quartz floors junction with the dyke and the slate walls.

Probably the greatest displacement has occurred along planes parallel to the bedding, but this class of movement is particularly hard to detect, except where a line of dyke cuts across the strike of the beds. In the survey of the mines in the area north of the one under discussion, I have recorded numerous instances of such movement, and the annexed section in the Blue Ribbon mine at Ten Mile (Fig. 6) may prove of value in application

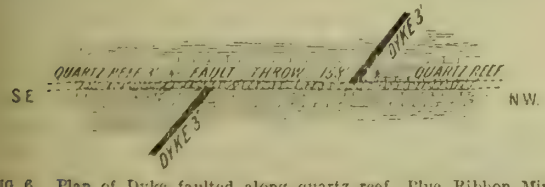



Fig. 6. Plan of Dyke faulted along quartz reef, Blue Ribbon Mine, Ten-Mile.

to the mines further south. In this instance, if the dyke were not present, there would have been no evidence of faulting beyond the formation of a reef parallel to the bedding planes.

Along the junction of the Lower and Upper Palæozoic rocks there is much local faulting, but it is evidently confined to the latter beds, and is due to the collapsing and sliding of the flat-bedded rocks along this junction with the older formation.

## METAMORPHIC ROCKS.

On proceeding in an easterly direction across the surveyed area a gradual transformation of the Lower Palæozoic slates and sandstones of the gold-field may be observed, the alteration being apparent to the eye about a mile east of the junction of Stander's Creek with the Goulburn River, and increasing in degree until the rocks in the vicinity of Mount Selma are of the phyllitic type. The metamorphism appears to have been regional, as there is no evidence of the presence of any plutonic mass capable of causing the alteration observed in the rocks.

Local or contact metamorphism has, however, affected the beds surrounding and north of Connor's Plain. This alteration, which is confined to the area into which the basic green dykes have been intruded, has hardened the Lower Silurian and Upper Ordovician beds of that locality, and has led to the production of a large amount of quartz along the various fracture planes in the rocks.

Careful prospecting in this locality may result in the opening up of payable metalliferous lodes. Assays from seven of the many lodes showed traces of gold and silver in every sample and of copper in one of them. The samples were taken at random, not picked.

## DYKES.

In the area under consideration there are three distinct types of dykes which appear to have been intruded at different epochs; they are 1, the intrusive basalts (youngest); 2, the basic dykes in the metamorphic series; and 3, the auriferous diorites (oldest). Notes on the petrology of some of the igneous rocks of the Wood's Point district are given in the Appendix by Professor E. W. Skeats, D.Sc., A.R.C.Sc., F.G.S.

### BASALT DYKES.

The intrusive basalts have already been described in general under the heading "Older Basalt."

### BASIC DYKES IN THE METAMORPHIC SERIES.

The area of metamorphic rocks extending from just south of Connor's Plain northwards to the northern boundary has been invaded by a large number of greenish or green-grey dykes, which are confined within the limits of the metamorphosed rocks; they have, in all probability, been the direct cause of the metamorphism. These dykes are probably antecedent in age to the basalt flow of Connor's Plain, as they are to be observed to the north and south of it, but they are completely covered where the flows exist. It is probable that they represent a period of volcanic energy, the final stage of which has been the production of lava. The largest individual area of dyke-rock occurs in vicinity of the 7-mile tree N.W. of Connor's Plain; this dyke is 2 miles long by 15 chains wide, and it is interesting to note the manner in which the dyke follows the anticline that brings the Upper Ordovician rocks

to the surface. The contact of the south end of this dyke with the Silurian rocks is marked by a large amount of quartz.

### DIORITE DYKES.

The petrographic determinations of Professor J. W. Gregory[1] and Dr. A. W. Howitt[2] indicate that diorite, the name generally applied to the auriferous dykes of the Walhalla-Wood's Point-Gaffney's Creek mining belt, may be accepted as substantially correct.

Various changes, due to magmatic differentiation, chemical alteration of the original constituents, &c., have given rise to (1) ophitic andesite-dolerite; (2) quartz-diabase-porphyrites; (3) diabasic mica-diorites; (4) propylitic diorites.

Judged from their field relations, these varieties are approximately contemporaneous, and are probably the products or emanations from a common magma. It is probable that they are offshoots of some underlying plutonic rock similar in age and composition to the outcropping granodiorites of the adjacent Baw Baw mountains.

Dykes of this type may be traced from the contact of the Baw Baw granodiorite with the Lower Palæozoic sediments to a point about 1¼ miles east of the township of Wood's Point. A line extended from this point south-easterly towards Walhalla and north-westerly towards Gaffney's Creek and Jamieson, may be considered as marking the general eastern limit of country intersected by these dykes.

In strike the dykes generally conform to the trend of the enclosing slates and sandstones, although numerous instances may be observed where they cut across the beds at all angles. The direction of dip is generally regulated by the inclination of the beds in which the dykes occur, but in this respect there are also numerous exceptions. Diversity in strike and dip occurs with greater frequency when the dykes are near folded beds.

I am satisfied that many of the dyke lines are individually continuous throughout the length of the belt, and that many of those worked at Walhalla are identical with those of Wood's Point, Gaffney's Creek, &c. The apparent breaks in continuity are due to the outcrops being covered with an overburden of rock, soils, or vegetable matter. The dykes may be traced in a continuous belt from the Tertiaries south of Walhalla northwards to the Carboniferous rocks of the Mansfield district, a total distance in a direct line of about 70 miles.

As a rule, the dykes decompose much more readily than the enclosing rocks, and yield a buff-coloured, soft, but fairly tenacious clayey rock interspersed with spangles of mica or chlorite. At depths varying between 100 feet and 300 feet the decomposition becomes less marked, and the rock assumes a greyish-blue or greyish-white appearance and hard texture. The less decomposed dyke-rocks are usually charged with a fair percentage of iron pyrites and occasionally with copper pyrites.

Induration of the enclosing strata may frequently, but not invariably, be observed, a noticeable exception being the Morning Star dyke-bulge at Wood's Point, which, although 1,700 feet in length and upwards of 300 feet in width, has left the contact rocks almost unaltered.

The usual width of the dykes varies between 1 foot or 2 feet and 20 feet, and may remain regular over considerable lengths; for instance, the Waverly dyke maintains an average width of 3 feet for several miles. Exceptions, however, are seen in the occurrences of dyke-bulges, or, as they are locally termed, "dyke-basins," where the dyke, the normal width of which may be only a few feet, may suddenly become 300 feet or even 400 feet wide for a distance of upwards of 2,000 feet. In such cases the contained quartz-reefs also increase in size, and have produced such gold mines as New Loch Fyne, the Morning Star, the A1, and others.

The economic importance of the Walhalla-Wood's Point-Gaffney's Creek auriferous belt is almost entirely due to the intrusion of these dykes into the Palæozoic rocks. The quartz lodes from which the gold is obtained are of two types: (1) those occurring in the dyke-mass; and (2) those occupying faults or fissures which, at some point or points, come into contact with the dyke.

Of the former, the Loch Fyne, Shamrock, Morning Star and Hope, and A1 may be cited at leading examples; and of the latter, the Long Tunnel, Toombon, Excelsior, Harbinger, Victor's Quartz, All Nations, New Dempsey's, Sailor Bill's, Star of the West, &c. The total product of gold from these mines reaches many tons.

The greatest depths attained in mining in the various portions of the auriferous belt are:—Walhalla, 4,000 feet; Toombon, 1,200 feet; Matlock, 600 feet; Wood's Point, 800 feet; Gaffney's Creek, 1,000 feet; and Ten Mile and Kevington, 900 feet.

## QUARTZ REEFS.

### REEFS IN THE DYKES.

Reefs of this type are usually spoken of as "floors" of quartz. They are evidently due to the infiltration of silica and associated minerals into fissures resulting from the contraction which followed the drying and cooling of the dykes from a plastic condition. The fissures usually assume a roughly prismoidal arrangement, dipping alternately to opposite walls, with a pitch in the direction of the longer axis of the dyke-bulge. The reefs vary in width from a few inches to 15 feet or 20 feet, and in the larger dyke-bulges they occur about every 50 feet or 60 feet apart.

As far as mining depths have attained, there has been no break in the downward continuity of the reef system, and the reefs are found alike in the decomposed and apparently unaltered dyke. The quartz-reefs of the New Loch Fyne mine are confined to the dyke-mass itself, and do not penetrate the enclosing walls, but in the Morning Star dyke-bulge the reefs break into the slates for distances up to 200 feet. (Fig. 7.) In the former instance, the dyke is confined between solid bands of sandstone, and jointing has probably been confined to the dyke alone; while in the latter the dyke is encased in alternate slate and sandstone, and the eruptive energy has probably fractured the country to a much greater degree, giving rise to the channels in which have formed the numerous quartz veins that ramify away from the main floors.

[1] Appendix to the Wood's Point Gold-field, by O. A. L. Whitelaw, Mem. No. 3, Geol. Surv., Vict., 1905, p. 30.
[2] Appendix to the Walhalla Gold-field, by H. Herman, Spec. Rept. Geol. Surv., Vict., 1901, p. 56.

The quartz reefs or floors are generally larger and more productive of gold on the side of the dyke from which they dip; this is, in most cases, the hanging-wall, or upper side, of the dyke. For instance, in the Loch Fyne mine the dyke dips east, and all the reefs have their origin on the eastern side, and seldom extend quite as far as the western wall of the dyke. (See Pls. XVIII. to XXV.)

This fracturing probably occurred either contemporaneously with the eruption of the dyke, or during the subsequent settling of the strata.

Figs. 8, 9, and 10 illustrate three different modes of occurrence. In the Garibaldi mine, Matlock, the dyke itself has not reached the surface, the

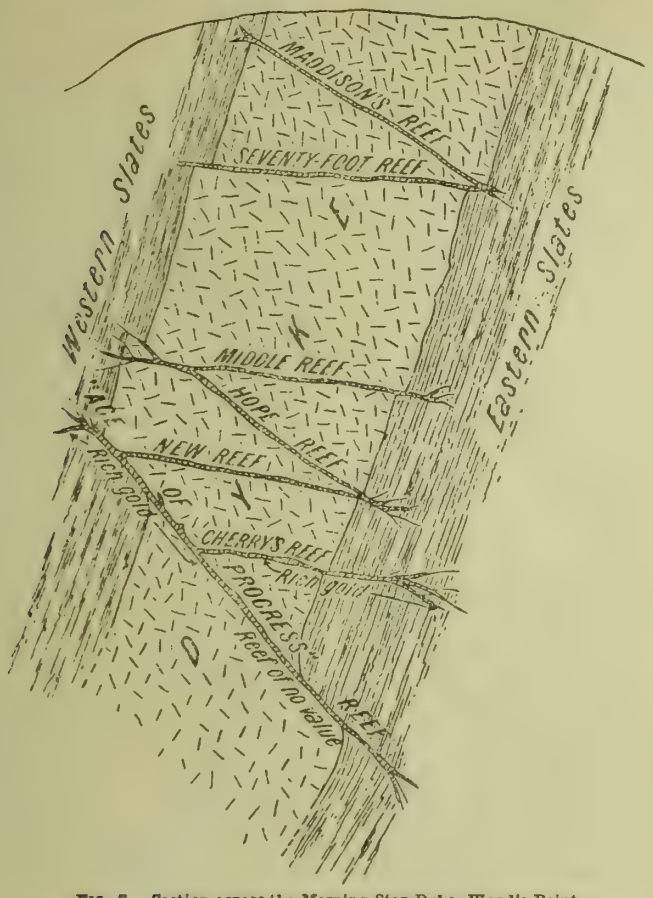



FIG. 7. Section across the Morning Star Dyke, Wood's Point.
Scale, approximately, 150 feet to 1 inch.

In the Morning Star mine the dyke dips west. The main reef of this dyke is unquestionably that known as the Age of Progress, which dips from the western to the eastern wall of the dyke, and carried practically all its gold values on the western wall.

In the smaller dykes the quartz veins are much closer together.




FIG. 8. Vertical section of reef and dyke, Garibaldi Mine, Matlock.

REEFS CONTIGUOUS TO THE DYKES.

Reefs of this type form no inconsiderable feature in this belt, and appear to result from the fracturing, in a more or less nearly vertical direction, of the rocks in proximity to lines of dyke.

upper portion of the fissure being filled with secondary quartz (Fig. 8). An occurrence on the range dividing Victor's Quartz and the New Chum mines, shows a similar formation

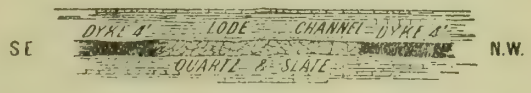



FIG. 9. Plan of reef and dyke near Victor's Quartz Mine

(Fig. 9). In this case the north and south ends of the fissure are occupied by the dyke, while the central portion is filled with quartz. Fig. 10, a plan taken in No. 2 north adit-level, Victor's

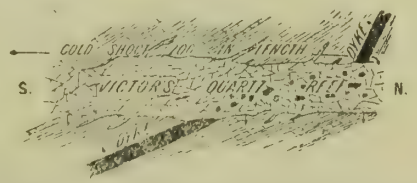



FIG. 10. Plan showing relation of reef and dyke No. 2 north adit-level, Victor's Quartz Mine.

Quartz mine, shows the strata and dyke fractured in an oblique direction; the fault forms the lode-channel of Victor's Quartz reef. The Excelsior, Harbinger, Balmoral and All Nations (Prince of

Wales reef) mines exhibit a structure somewhat similar to that of Victor's Quartz, and have yielded large amounts of gold at, or near, the contact of the lode and dyke.

In the McIntyre's Quartz, Pheasant Tail, Vulcan group, Republic, and other mines, the reefs occur along the bedding, and there is no direct evidence of their association with dykes, but it is probable that further development will indicate that they, also, have come under the influence of the dykes.

### RELATION OF AURIFEROUS QUARTZ TO THE DYKES.

That the presence of gold in the lodes of the Woods Point mining belt is the direct result of the intrusion of diorite dykes into the Lower Palæozoic rocks, can permit of no doubt when all the available evidence is taken into consideration.

The gold-bearing quartz veins, practically without exception, are found to occur (1) in veins within the dyke mass; (2) in veins along the walls of dykes adjoining the sedimentary beds; (3) in veins filling fractures in the contact slates; or (4) in faults and fissures radiating from, or cutting through, the dyke.

Gold appears to have been deposited most abundantly in the dykes and associated quartz veins penetrating the Walhalla beds, and to a lesser degree in the Jordan River series.

The Upper Ordovician beds, which are well developed in the upper portions of the Jordan River, are intersected to as great, or even to a greater extent than, the auriferous belt, by dykes which exhibit all the characteristics of those of the gold-field; but I am not aware of any instance of payable gold having been obtained in them, or of alluvial gold having been found in streams confined to the Upper Ordovician. In the Jordan River the bed of the stream, while cutting through Silurian rocks, has been mined for alluvial gold for several miles, but upon reaching the contact of the Upper Ordovician, the alluvial gold ceased. This would indicate either (1) that the deposition of gold has been confined to a belt of dykes of definite type, whose western limit does not reach the Ordovician rocks; or (2) that the age, or nature of the beds, has influenced gold precipitation.

As nearly all the streams of any considerable magnitude have carried payable alluvial gold when cutting through Silurian rocks, while none has been worked in the Ordovician, it is probable that the latter explanation is correct.

In the absence of any established theory, the suggestion may be offered that the dykes and associated reefs are the two consolidated forms into which the original intruded magma has separated during cooling; one portion first formed the dyke rock, and the other, which remained more mobile, then deposited the quartz and with it the gold and other metals. The thin laminated portions along the walls of the large reefs contain most of the gold, and it appears that these portions were the last to be deposited from solution.

At Wood's Point the gold to a depth ranging between 100 feet and 200 feet from the surface is in almost a pure state; between this and the greatest depth attained by mining, it is associated with sulphides of lead, zinc, and, to a less extent, copper.

In the reefs of the dyke-bulges the gold has been deposited with more regularity along the line of strike, than transversely to it. For instance, in the Morning Star, Hope, and Alps leases, the Age of Progress reef has been worked from its outcrop on the surface on the western wall of the dyke north-west along that wall for 1,500 feet. Spurs of quartz breaking into the western slates have also been worked for 40 or 50 feet from the wall. On its dip easterly towards the other dyke-wall, this reef carried payable values only as far as the centre of the dyke, while on the eastern wall it has proven unpayable throughout the length of the dyke. In the case of Cherry's reef, in the same mine, the reverse order was the case, the values being carried along the eastern wall for a distance of 1,100 feet and into the eastern slates for upwards of 200 feet; payable gold was obtained in the dyke for about 100 feet from the eastern wall, while the western portion was unpayable.

As an instance of the richness of these lodes on their respective walls, it may be mentioned here that they yielded 36,227 oz. of gold from 10,937 tons of stone, the product of nine months crushing in 1864, and 57,848 oz. from 16,996 tons in 1865. As will be seen from Fig. 7, the gold occurs on that side of the dyke from which the reef dips, and that in each case the reef is formed on a reversed fault, with the slate underlying the reef on the auriferous side.

In the New Loch Fyne mine, the reefs have been worked for a length of 700 feet along the dyke, with the richest values practically confined to the eastern wall and for 100 feet into the dyke.

In the fault-reefs the gold shoot is generally found to occur at, or close to, the point of contact of the lode and the dyke, and for some distance along the former. No definite rule can, however, be laid down for this mode of occurrence, as the manner in which one has affected the other is often disguised. It may, however, be generally accepted that the shoot of gold will be found to occur in the lode in proximity to its point of contact with the dyke, and that the pitch of the shoot will be coincident with that of the junction of lode and dyke. The richest mines of this type are the All Nations and Victor's Quartz; the former yielded 131,720 oz. of gold in a vertical depth of about 400 feet, and the latter 24,193 oz. from 42,634 tons in a vertical depth of 300 feet.

### REEFS OUTSIDE THE DYKE-BELT.

It is not generally recognised that there is a considerable group of mines in the Wood's Point district that have no relation to, nor features in common with, those of the dyke belt. These reefs occupy a belt of country lying between 4 and 5 miles east of the township of Wood's Point and 2½ miles east of the most north-easterly known line of dyke.

The containing rocks are mostly older than those of the dyke-belt and consist of somewhat metamorphosed yellow slates and sandstone bars, probably belonging to the Jordan River series for the most part. The mines form two groups. 1. Those of McCaul's Reward, embracing Black George's, McCaul's Reward, Leichardt, Jubilee, New Standard, and Golden Fleece, and at the southerly termination of the belt, the Leviathan, Knopp's, and Great Leviathan reefs. The former are in rocks of the Jordan River series, and the latter three probably in the base of the Walhalla series. 2. The second may be termed the Royal Standard group; it lies about 1¼ miles east of Group 1, and embraces the Christmas, Bobby Burns, Champion, Mulholland's Oriental, Royal Standard, Strap and Buckle, and Mount Selma reefs.

The reefs of the McCaul's Reward group all occupy fault planes cutting the beds in both strike and dip.[1] In the Leichardt mine the occurrence of the small quartz vein which carries practically the whole of the gold—cutting in an irregular manner through the larger reef—is interesting and instructive, as evidence of the increased richness of the last-formed quartz bodies. The Leviathan mine has been the best gold producer in Group 1, and is said to have paid £17,000 in dividends from gold won between the outcrop and creek level.

The reefs of the Royal Standard group appear to be the direct result of deposition of quartz along the bedding planes of the containing rocks. The difficulty in this belt is to distinguish bedding from cleavage. The latter is so highly developed that it has almost obliterated the former. The beds consist almost entirely of highly-cleaved, silky argillities (metamorphosed slates), and in underground sections the most careful examination often fails to disclose the bedding planes. It is only when the axes of the folds are met that a definite separation of the two can be made. On the surface the weathered rocks show more clearly the bedding as lines of colour, with the result that the main lines of folding can be fairly well traced out.

Predominant as cleavage is in these beds, it has not formed the channels along which the quartz veins have been deposited, nor is there sufficient jointing developed to form planes of deposition.

The numerous large bodies of quartz in this belt dip at low angles, and cut the cleavage planes obliquely (Pl. XIV., Fig. 2). Considerable regularity in dip can be observed in bodies of quartz adjacent to the same fold; a pitch is developed on the reefs which is at the same angle as the observed pitch of the folds, where such is determinable; and in at least two instances the reefs can be seen to coincide with the folding of the beds, both as to direction and pitch, and are undoubtedly true saddle-reefs.

I am satisfied, after an exhaustive examination of the reefs of the Royal Standard group, that they occur on the bedding as true saddle or inverted saddle reefs, or as a combination of saddle reefs and fault reefs associated with the axes of the folds (Pl. XIV., Fig. 2). In my opinion, this fact must be recognised, and if mining in this belt is to be re-established, development must be confined to advancing prospecting drives along the main lines of folding.

The chief gold-producing mine of this belt was the Royal Standard mine, which returned 13,718 oz. of gold during five months in 1866.

## SUGGESTIONS FOR FUTURE MINING.

Mining in the Woods Point district has probably never been more decadent than at the present time.[1] Of the larger mines, only the New Loch Fyne and the All Nations have not been abandoned, and in these, only two or three men are employed at stoping old ground or prospecting the upper levels. Small co-operative parties such as Sutcliffe Bros., George and sons, Postle and party, Waters, and O'Keefe, Newton and party, still continue at work on the smaller reefs and dykes, and, fortunately for the district, produce regular, if small, returns.

Development at a depth, if it can be said that such has ever been undertaken, has absolutely ceased, and this field will shortly be only a matter of history unless a vigorous policy of prospecting to lower depths is undertaken. In the future, shafts must supersede the old tunnelling operations. Much as the latter method may have had to recommend it when short cross-cuts only were necessary, when the dip and pitch of gold shoots had to be determined and the ground drained in the absence of machinery, tunnels have now had their day. In fact, in the later stages of mining, tunnelling has proven a positive evil.

In the New Loch Fyne, Matlock, an adit, sufficiently wide to allow of a double horse-tram, was driven a distance of 1,968 feet to cut the dyke-bulge. This afforded from 100 to 150 feet of unprospected dyke below the worked reefs, and converted the company's credit balance of £16,000 into a debit balance. Only one small reef, which returned about 11 dwt. per ton, was cut. The company is now in precisely the same position in regard to development that it occupied before this large amount of money was expended. The shaft already sunk 100 feet below No. 3 level will have to be deepened to command the reefs which, there is every reason to believe, exist below the worked-out bodies.

In Victor's Quartz the lowest adit-level was driven as a cross-cut for 1,425 feet, and as a level for 400 feet, to command 250 feet vertical on the reef.

In fact, throughout the district the lowest adit-tunnel may be regarded as an artificial boundary between a zone that has proven highly productive of gold and one that is apparently considered unworthy of prospecting by shafts. This is a remarkable position, considering the large quantities of gold obtained from above the tunnel levels and the fact that practically no prospecting worthy of the name has been done below them.

I am satisfied, after a careful examination of all the mines, that the shoots in their upper parts are likely to be reproduced to much lower depths than have yet been attained; and, granting the possibility of some impoverishment in values the further the sulphide zone is pierced, that it is probable the reefs will prove commercially profitable.

As I have previously pointed out[2], the sole attempt at prospecting the larger dyke-bulges below tunnel level was in the Hope claim on the Morning Star hill, Wood's Point, where the shaft has been sunk upwards of 400 feet below the Hope adit-level, or 300 feet below the subjacent branch of the Goulburn River. The results were negative, except that at the lowest level driven the management reported a fair body of stone showing gold; but, as this was dipping underfoot and the company was not in a position to sink the shaft, the project was abandoned.

As previously stated, the Hope shaft is in an unsatisfactory position, because it was sunk in the centre of the dyke and at a point on the strike of the reefs where all proved consistently poor in the upper levels. In addition, there was the comparatively great depth, owing to the northerly

[1] This was written in 1914.
[2] The Wood's Point Gold-field, by O. A. L. Whitelaw, Mem. No. 3, Geol. Surv., Vict., 1905, p. 28.

pitch developed in the quartz floors, to which the shaft had to be sunk to intersect each reef. For instance, Cherry's reef and the Age of Progress reef—the two main reefs of the upper system—outcrop at the surface in the Morning Star ground; these were cut in the shaft at 420 feet and 470 feet from the surface respectively. Thus, provided the system of northerly pitches exhibited in the worked reefs continues below the adit levels, a reef cut at 1,000 feet in the Hope shaft would be (allowing for hill slope) within about 200 feet of the surface at the south end of the dyke-bulge in the Morning Star ground.

The reefs of the Morning Star hill are reported to have yielded 260,000 oz. of gold from above the adit-levels, and those of the New Loch Fyne, 86,000 oz. from above No. 5 adit level. No prospecting has been done below No. 5 level in the New Loch Fyne mine, and, with the exception of the diamond-drill boring and the unsatisfactory Hope shaft, nothing has been done below the adit-levels of the Morning Star group of mines.

Admitting the speculative nature of any class of mining for ore-deposits beyond those which can be actually demonstrated to exist, I am of the

SUMMARY OF RESULTS OF BORING, MORNING STAR DYKE.*

| Bore No. | Depth of Sample. | Description of Sample. | Gold per Ton. |
|---|---|---|---|
| | ft. in. ft. in. | | oz. dwt. gr. |
| No. 1 (total depth, 714 ft. 5 in.) | 19 0 to 29 6 .. | Diorite with quartz veins up to 18 inches thick highly charged with pyrites | |
| | 54 10 „ 88 10 .. | Coloured diorite with quartz veins | |
| | 88 10 „ 111 0 .. | Pyritic diorite; 1 foot of quartz showed gold when crushed | |
| | 121 3 „ 123 7 .. | Quartz | |
| | 164 8 „ 170 8 .. | Pyritic diorite with quartz | |
| | 214 8 „ 274 8 .. | Diorite with quartz veins | |
| | 274 8 „ 319 8 .. | Pyritic diorite with quartz veins | |
| | 396 3 „ 425 11 .. | Diorite with quartz veins up to 14 inches thick | |
| | 441 0 „ 453 0 .. | Diorite with quartz veins .. .. .. .. | trace |
| | 496 11 „ 504 9 .. | Diorite with 6 inches of pyritic quartz at 503 ft. 7 in. | |
| | 498 0 „ 500 0 .. | Quartz leaders and pyrites .. .. .. .. .. | trace |
| | 538 0 .. .. | Quartz 2 inches thick, with pyrites | |
| No. 2 (total depth, 723 feet) | 30 0 to 32 0 .. | Light-coloured diorite with quartz .. .. .. .. | 0 1 7 |
| | 32 6 „ 51 6 .. | Quartz with iron pyrites .. .. .. .. .. | 0 1 15 |
| | 83 0 .. .. | Quartz and iron pyrites .. .. .. .. .. | 0 1 15 |
| | 92 8 .. .. | Quartz, felspar, and iron pyrites .. .. .. .. | 0 1 15 |
| | 183 0 .. .. | Quartz and pyrites .. .. .. .. .. | 0 1 14 |
| | 187 0 .. .. | Quartz and pyrites .. .. .. .. .. | trace |
| | 202 0 .. .. | Quartz and pyrites .. .. .. .. .. | trace |
| | 208 0 .. .. | Quartz .. .. .. .. .. .. .. | trace |
| | 322 0 to 326 0 .. | Quartz and pyrites .. .. .. .. .. | 0 9 18 |
| | 326 0 „ 329 6 .. | Quartz and pyrites .. .. .. .. .. | 0 13 1 |
| No. 3 (total depth, 866 feet) | 122 6 „ 131 6 .. | Light-coloured diorite with a little quartz | |
| | 244 0 „ 271 6 .. | Light-coloured diorite with a little quartz | |
| | 330 0 „ 339 0 .. | Light-coloured diorite with a little quartz | |
| | 392 0 „ 394 6 .. | Quartz showing gold | |
| | 384 0 „ 396 0 .. | Quartz and iron pyrites .. .. .. .. .. | Nil |
| | 488 6 „ 528 6 .. | Light-grey diorite with veins of quartz | |
| | 728 0 „ 751 0 .. | Quartz with pyrites, felspar, and diorite .. .. .. | 0 3 6 |
| | 752 0 .. .. .. | Quartz with felspar and iron pyrites .. .. .. | 0 3 6 |
| | 762 0 to 764 0 .. | Quartz with felspar and iron pyrites .. .. .. | trace |
| | 863 0 „ 864 4 .. | Quartz, slate, and iron pyrites .. .. .. .. | trace |

No. 1 bore was sunk from the United company's adit 350 feet below the surface.

No. 2 bore was sunk from the Hope adit-level 390 feet below the surface, and was inclined west at the assumed angle of dip of the dyke. A shaft was afterwards sunk at this bore-site, but the formation between 322 feet and 329 feet did not approach in gold contents the values indicated by the assays (10 dwt. to 13 dwt. per ton). No satisfactory explanation of the discrepancy can be given.

No. 3 bore was sunk from the surface in the Morning Star lease, near the south-east end of the dyke-bulge.

The recurring value—1 dwt. 15 gr. of gold per ton—appears to be the average value of the pyrites whether it occurs in the reefs or is disseminated through the dyke.

* See Diamond Drill Rept. No. III., 1887, p. 32 (bore No. 1); Ann. Rept. Sec. Mines, 1889, pp. 78, 82 (bores Nos. 1, 2, and 3); *Ibid.*, 1890 p. 92, and *Ibid.*, 1891, p. 87 (bore No. 4).

Although there are some unsatisfactory features in regard to the records of boring in the Morning Star hill, the general results establish the continuity of the reef formation at a depth; and assays taken from the diamond-drill cores at 575 feet below the Morning Star adit-level are reported to have returned 3 dwt. 6 gr. of gold per ton; and at 230 feet below the same adit-level, 2 ft. 6 in. of quartz, showing gold, is reported as having been cut. In the bore at the extreme north end of the dyke-bulge, a large amount of quartz was intersected, and that cut at 500 feet below the surface is also reported as having showed gold.

opinion that all the evidence relating to the two mines under discussion, coupled with the late satisfactory developments in their prototypes, the A1 and the Rose of Denmark mines at Gaffney's Creek, at 900 feet and 1,300 feet respectively, justifies the expenditure of capital in exploiting these mines thoroughly at a depth.

I would suggest that the present shaft of the New Loch Fyne mine be sunk at least 300 feet below No. 5 level; and that a new shaft in the Morning Star mine be sunk at a point in the western slates, so situated that it would enter the dyke-bulge on the western contact at the level of the Morning Star adit, and about 200 feet north

of the south end of the bulge. This location would command the reefs where they are nearest to the surface, and approximately in a position where they have carried their richest values.

As a supplement to this, and possibly as an important factor in inducing shaft-sinking, I would suggest putting down four bores in the Morning Star hill. (1) On the western side of the dyke 200 feet north of the south end of the dyke, a vertical bore at the shaft-site; (2) at 600 feet from the south end of the dyke on its western side and about 50 feet in the dyke, an inclined bore at the same angle of dip west as the dyke; (3 and 4) two bores in the eastern wall of the dyke at 200 feet and 600 feet north of the south end, and inclined west at the angle of dip of the dyke. These bores should attain a depth of not less than 400 feet vertical below the Morning Star adit-level.

In the New Loch Fyne mine two vertical bores should be sunk from No. 5 level to a depth of 500 feet, one at a point in the cross-cut as close as possible to the position of the shaft, and the other at the point where the line of transverse section "E" cuts No. 5 level; the latter bore would be 310 feet north of the former.

## DETAILS OF MINING.

### ALLUVIAL DEPOSITS.

The following valuable notes on the occurrences of alluvial gold in the Jordan River valley have been supplied by Mr. H. J. Bennett, who has been engaged in mining operations on this field since its inception.

At the Bluff spur near the junction of Dry Creek and the Jordan River, the latter was worked by R. Martin and party for rich returns. A great many rich specimens of auriferous quartz were obtained, and these had to be crushed to free the gold. Mr. Bennett searched for the feeder, which is assumed to exist under the alluvial deposit, and succeeded in cutting a well-mineralized formation 7 feet in thickness, from which, however, he obtained no gold. He is of opinion that the auriferous lode, should it exist, can only be discovered by removing the overburden by hydraulic sluicing. Below the Bluff spur McCulla and party obtained 60 oz. to the paddock.[1]

Dry Creek was not rich for some distance above its junction with the river, but improved in the higher reaches up to the New Chum line of reef.

Antimony is said to have been obtained on the Jordan River between Dry Creek and Red Jacket Creek.

Red Jacket Creek was not rich for the first mile above the Jordan River, but both the creek and spur workings then suddenly increased in richness, as much as 60 oz. to the paddock being obtained. The creek continued rich for a distance of 1½ miles, where 90 oz. to the paddock was obtained. A reef from 3 feet to 4 feet in thickness crossed at this point, but no gold was found in it. Above the reef the creek was not so rich, but it continued payable to the junction of Ross's Creek, and at this point some good claims were worked, and nuggets up to 5 oz. were found. The feeders have not yet been located. A little alluvial gold was obtained to the head of Red Jacket Creek.

Ross's Creek was payable for a mile above Red Jacket Creek, and then it increased in richness. Messrs. Bennett, son and Fleming were granted £120 from the Government prospecting vote to prospect for the lode at this locality, but they failed to locate the reef (subsequently found by Mr. Donald McIntyre), by starting loaming operations a few feet too high. Payable alluvial gold practically ceases in Ross's Creek at the point where McIntyre's quartz reef crosses it.

The same party then prospected Valentine's Creek, and located a reef 4 inches thick carrying gold and heavy mineral. Subsequently C. Green located Green's reef, and Murphy and party, Stackpoole's reef.

[1] 16 feet in length, but often referring to 4 men's ground (64 feet).

The Jordan River was comparatively poor for ¾ mile above Red Jacket Creek junction, but the ground then increased in richness, Enright Bros. winning £1,500 worth of gold from one large paddock. Above this the ground was poorer until the BB Star belt was crossed, when it again increased in value. The Jordan River prospectors worked some good ground at this point, and in Poole's claim a 19-oz. nugget was found. Near the township of Jericho, Little's party obtained an 80-oz. nugget, and H. Strauss 117 oz. from one paddock near the junction of BB Creek. On the spur opposite this claim nuggets of 10 oz. and 12 oz. were found, and nuggets up to 40 oz. in weight in the first flat in BB Creek.

BB Creek was consistently rich throughout, Curtain and party getting up to 73 oz. per paddock in the hill workings, and 150 oz. coming from a 12-ft. paddock above the Charleston spur. BB Creek continued rich to the junction of the two main branches, the best values continuing up the right-hand branch to the Loch Fyne dyke.

The Jordan River continued rich in alluvial gold for half-a-mile above the junction of BB Creek, and gave as much as 150 oz. to the paddock. In Grogan's claim (see plan of BB mine workings), many nuggets were obtained, the largest recorded being 82 oz., 37 oz., 36 oz., and 22 oz. These were all unearthed near the point where the south end of the BB dyke crosses the Jordan River. This portion of the creek (Pl. X., Fig. 2) was worked for the second time by Messrs. Bennett and sons, the largest nuggets found being 20 oz., 13 oz., and 11 oz. Much of this gold was rough and not waterworn. The average value of the gold near the dyke was £3 13s. 9d. per oz.; above, it improved to £4 1s. 6d. For some distance above the BB dyke, the Jordan River was poor, paddocks varying from 8 oz. to 12 oz. for about a mile, but then it was again enriched, Cadogan and party getting 60 oz., Thompson and party 50 oz., and others from 22 oz. to 27 oz. to the paddock. From this point upwards, the Jordan River cuts through Upper Ordovician beds, and according to Mr. Bennett, claims did not average more than ½ dwt. per paddock.

### REEF MINING.

The mines described in this report are all, with the exception of the Queen Bee reef, situated on the western side of the Mount Selma sandstones in beds of Upper Silurian age belonging to the Jordan River and Walhalla series.

In addition to the mines described in the following pages, those in the subjoined list have already been dealt with in my former report, Memoir No. 3, The Woods Point Goldfield:—the Morning Star dyke-workings, the old Morning

Star Gold Mining company, Cherry's old workings, the old Hope company's workings, the old Alps company's workings, the Hope Gold Mining company, the Comet company, the Woods Point company, the Little Comet Gold Mining company, Sir John Franklin Gold Mining company, Johnson's reef, Never Mind Gold Mining company, the Waverley dyke, All Nations Gold Mining company, McCaul's Reward Gold Mining company, Leichardt Gold Mining company, Burke and Wills Gold Mining company.

#### QUEEN BEE REEF.

This reef is situated on the Main Divide at the point where the Upper Ordovician black slates cross the ridge to the east of Mount Selma. A small shaft has been sunk on one of the quartz reefs of which the Upper Ordovician rocks are so productive. The reef consists of a stockwork of quartz veins aggregating 10 feet in thickness, and containing a considerable amount of iron pyrites. I have prospected the dumps, but could find no gold; it is therefore probable that the workings were speculative only, and that they were carried out at the time of the gold rush through these parts of the mountains following upon the discovery of the phenomenally rich Royal Standard reef.

#### ORIENTAL MINE, ABERFELDY RIVER.

This reef is situated on the north side of the Aberfeldy River, near the southern boundary of the map. The workings are by shaft, and evidently do not exceed 100 feet in depth. I could gather no information regarding yields, and little can be seen of the structure of the reef. The reef has evidently proven auriferous to some extent, as an old battery site, almost hidden in dense scrub, can be seen just east of the shaft. The Aberfeldy River has been worked for alluvial gold above and below where the line of the Oriental reef crosses it.

#### UNION JACK REEF.

This reef is a well-defined body of quartz 2 or 3 feet in thickness. A shaft has been sunk at the point where it crosses the Main Divide north-west of Mount Selma. The main shaft is about 60 feet in depth, but I could see no evidence of any stoping. It is probable that it is one of the many prospecting shafts sunk during the Royal Standard mining boom.

#### MOUNT SELMA MINE.

This mine is situated a little to the west of Mount Selma, and is just below the crest of the Main Divide, on the fall towards the Aberfeldy River. It has been worked by means of adits. The reef is in rocks of Lower Silurian age, consisting of green slates associated with small bands of black slate somewhat similar in appearance to the "indicators" of the western gold-fields. The lode is mullocky and about 10 feet thick, dips eastwards and apparently pitches in a southerly direction. A small body of stone in the lode appears to have contained the payable values. I have been unable to ascertain the tonnages crushed, but the first yield is said to have been about 160 oz. of gold. When cleaning up the gratings were found to be broken, and two nuggets weighing 9 oz. and 4 oz. were discovered in the boxes. According to report, 115 oz. of gold was obtained immediately under the grass roots. The mine appears to be worth further attention at a depth.

#### ROYAL STANDARD GROUP (ROYAL STANDARD, STRAP AND BUCKLE, ORIENTAL, AND MULHOLLAND).

A plan and section of these mines is given in Pl. XXVI.

The various reefs included in the above group occur near the crest of a spur, which separates Chandler's Creek from Stander's Creek, and running in a north-westerly direction from Mount Singleton on the Main Divide.

The country rock consists of a thick series of argillites belonging to the Jordan River series. The only sandstones are the thin beds shown in Pl. IV., Fig. 2. Cleavage is very pronounced, and the only indications of bedding away from the thin sandstones are lines of colour which can be noticed in some places.

The Royal Standard reef was discovered by William Singleton, his mate Frederick Stander being absent at the time. It is said that the reef stood several feet above the surface, and that the gold was visible a chain away.

The first crushing of 300 tons from this reef, in June, 1866, yielded 2,934 oz. of gold, or at the rate of 9 oz. 15 dwt. 14 gr. per ton of ore. Five months later the ore appears to have become exhausted, the date of the final crushing being the 9th November, 1866. The total amount of gold obtained during the period was 13,718 oz. of standard gold from about 7,000 tons of stone.

The greatest depth to which gold has been found in this reef did not exceed 70 feet, and practically the whole of the gold was obtained by open-cut working. (Pl. XIII., Fig. 2, and Pl. XIV., Fig. 1.)

From an inspection of the old workings it would appear that the auriferous shoot was about 300 feet long, and that the ground broken averaged about 20 feet wide. The numerous quartz leaders still to be seen in the walls of the open cut dip west at low angles and pitch north at about 15°. In such parts of the enclosing rocks as the angle of bedding can be observed, it is coincident with the reefs in dip and pitch. In fact, the famous Royal Standard reef appears to have been formed on an inverted saddle or syncline. Nos. 13 and 14 adits cut through the line of the lode channel at a depth of 200 feet from the surface. Beyond a rise into the open-cut workings, no further prospecting has been done. None of the remaining twenty-one adits cuts the Royal Standard line.

At 130 feet east of the Royal Standard syncline is a well-defined anticline. A considerable amount of quartz has been developed along this flexure, one outcrop between Nos. 12 and 13 adits being a solid body about 8 feet in thickness. In No. 16 adit the fold is well shown in the cross-cut connecting with a small shaft. On the eastern leg a well-defined solid body of quartz has been cut. This is absolutely coincident with the bedding, but on the cap of the anticline it has been somewhat faulted by an overthrust fold; the smaller bodies of quartz under the main leg fold over the anticline and have both eastern and western legs. There can be no doubt that they are saddle reefs (Pl. XIV., Fig. 2). A trial crushing of 20 tons from the leg in No. 16 adit returned 4 dwt. per ton.

Another anticline occurs 379 feet east of that last mentioned, and has produced the Strap and Buckle mine. The quartz here is associated with the folding, but also appears to have been deposited along planes of movement.

Between the Royal Standard and the Strap and Buckle lines there is another minor anticline which is well exposed in adit No. 19 (Pl. XXVI.). In this instance, several veins varying in thickness from 1 inch to 4 inches fold over the anticline and pitch north at the same angle as it.

The first crushing from the Strap and Buckle reef was put through in the latter part of 1869, and produced 323 oz. of gold from 80 tons of stone, an average of 4 oz. 0 dwt. 18 gr. to the ton. During 1869 and 1870 the party crushed 460 tons for 526 oz. of gold. I have not been able to ascertain the later crushings. This reef has been worked only at shallow levels, and should be worth further prospecting at a depth.

The Oriental workings are north of, and probably on the same line as, the Royal Standard and Strap and Buckle folds. The structure is similar, being apparently a combination of reefs associated with curvature of the beds and minor faults. The reefs are bodies of stone varying between 2 feet and 4 feet, but they are fairly low grade, most of the crushings being under 10 dwt. per ton.

The Mulholland or Fixed Star workings are north of, and on the same lines as, the Oriental. The reef has been worked to the level of Stander's Creek, a vertical distance of over 300 feet. The Mulhollands withheld their mining returns, but, according to local report, some of the ground yielded as high as 12 oz. per ton. The main reef has been stoped from No. 1 adit back to the Oriental workings. Where the reef is cut in No. 1 adit, an anticlinal fold can be observed pitching 55° N. Mulholland's reef is worked back to the Oriental on this observed pitch. Towards the end of No. 1 crosscut is another anticlinal fold with which is associated some nice lode formation. This is probably an extension of the Royal Standard anticline. Beyond exposing the reef for a few feet both north and south, no work has been done on this reef. As the fold pitches 45° N., it would be reasonable prospecting to extend a level south on the line of folding. To prospect for probable formations succeeding those of the main Royal Standard reef, the south drive at the commencement of the long cross-cut in No. 7 adit should be driven south along the anticline and cross-cuts should be extended at right angles to test the ground under the Royal Standard and Strap and Buckle open cuts.

### CHAMPION REEF.

The Champion reef is situated on the north-eastern or opposite side of Stander's Creek from the Royal Standard mine. It was opened up in 1866 and at the time very high expectations of its future were entertained. The reef is a well-defined body of stone, 2 feet or 3 feet thick, striking north-west and dipping east at a high angle. The rich gold appears to have been confined to a vein on the footwall side of the reef, but the whole of the lode appears to have been crushed.

The first crushing of 420 tons returned 315 oz. of gold (15 dwt. per ton). In all 1,030 tons yielded 564 oz. 15 dwt. Mining was carried on by adit, and no doubt the auriferous shoot could be located at lower levels.

### BOBBY BURNS REEF.

This line of reef adjoins the Champion, and was discovered during the same year. The reef has a well-defined footwall with several feet of spurry quartz ramifying into the hanging wall, but apparently the gold was confined to the vein on the footwall. The first crushing (180 tons of ore for 27 oz. of gold) appears to have been disappointing, as I can find no record of any subsequent crushings.

### LEVIATHAN MINE.

The Leviathan mine is situated immediately south of the Leviathan Creek, one of the main branches of Stander's Creek. (For plan and sections see Pl. XXVII.)

This mine was a regular gold producer for some years, and it is probable that the official return of 11,150 tons of stone crushed for 7,830 oz. of gold is considerably below the actual yield.

Three reefs have been worked, the two lower being known as the Eastern and Western, and the upper as the Flat reef.

The Flat reef is almost horizontal, with a slight pitch to the north, and its average thickness is about 2 feet. It has been worked for a breadth of about 90 feet, and for a length of about 120 feet. A considerable amount of sulphide of antimony is associated with this reef. A sample of ore from material still remaining in the stopes was submitted to the geological laboratory for assay, and returned 13 dwt. of gold per ton and 25.14 per cent. antimony; silver, nil. Along the eastern side of the stopes the Flat reef is seen in contact with the Western reef, and is distinctly faulted by the latter. The flat veins of quartz in adit E (see section A-B, Pl. XXVII.) on the eastern side of the Western reef may be the faulted portion of the Flat reef; but sufficient work has not been done at this point to make this certain.

The Western reef is an irregular body of quartz formed on a strong wall—probably a fault—dipping 85° E. It does not appear to have carried much gold when away from the Eastern reef, but the main shoot of gold in the latter apparently has its origin from the junction of these two bodies at the main open cut.

The Eastern reef is a body of quartz from 2 feet to 4 feet in thickness, with an easterly dip varying between 53° and 68°. With this is associated a small vein known as Knopp's which dips west at about 50°. The junction of these reefs is shown in adit C. Knopp's reef apparently cuts through the Eastern reef without faulting it.

The Eastern reef has been stoped out from its outcrop at the open cut to below creek-level, and for a length of 300 feet. Afterwards an engine-shaft was sunk in the bed of Leviathan Creek, and levels were opened at 60 feet and 160 feet below the plat. From just above the 60-ft. level the reef has been stoped back to the old workings; below the 60-ft. level the reef carries a little gold, but has been consistently poor, such stone as was crushed yielding about 2 dwt. per ton.

I was unable to examine the shaft workings which were always full of water during the time I was in the district. The information shown on the section was supplied by Mr. D. J. O'Sullivan, who was in charge of the last tribute party to prospect the shaft workings. He informs me that a vein of dyke, 2 inches in thickness, was cut in the bottom level.

The Leviathan reef is a well-defined fissure (or fault) lode cutting the country in dip (see cross section A-B, Pl. XXVII.). It is highly mineralized and still going downward strongly, and should, therefore, be worth further exploitation at a depth. No cross-cutting has been done in the mine, with the exception of the beds cut in adit B. A double fold, pitching south at 25°, is seen in this cross-cut.

### NEW STANDARD REEF.

The New Standard reef was worked during the period of activity on the adjacent McCaul's Reward and Leichardt reefs. The reef lies to the south-east of the latter on the north-eastern bank of Stander's Creek.

The workings are by adit, which discloses a reef about 2 feet in thickness stoped for a length of about 40 feet. The main reef underlies east, and is joined by some cross reefs where the shoot of gold occurred. Some crushings are said to have yielded 2 oz. of gold per ton. The first was 130 tons, for 201 oz. 11 dwt. (1 oz. 11 dwt. 22 gr. of gold per ton); the second, 100 tons for 154 oz. 9 dwt. 12 gr. (1 oz. 10 dwt. 21 gr. per ton); and the third, 230 tons for 387 oz. (1 oz. 13 dwt. 15 gr. per ton).

This mine has been idle for ten or eleven years, and should be worth further attention.

### GOLDEN FLEECE MINE.

The Golden Fleece mine is situated to the south-east of the New Standard, and although a battery was erected on Stander's Creek, no great amount of work has been done on the reef. The reef varies between 4 feet and 8 feet in thickness, but was low-grade, the first crushing of 700 tons yielding 169 oz. 12 dwt. of gold, an average of 4 dwt. 20 gr. per ton. The mine has been idle for the last ten or twelve years.

### BLACK GEORGE'S REEF.

This reef, which is about 1 foot thick and dips east, is situated immediately on the north-west side of the Goulburn River, near the Burnt Camp, and is apparently on the northern extension of McCaul's Reward group of reefs. The work was done by means of an adit, but very little development has been undertaken. The yields are said to have averaged about ½ oz. of gold per ton.

### BAILEY AND PEDEN'S REEF.

This is north of, and apparently on the same line as, Black George's reef, and has been worked by means of shafts. The reef is about 1 foot in thickness, and dips east. Small crushings are said to have yielded about 2 oz. per ton.

### EXCELSIOR MINE.

The Excelsior workings are situated on Blue Jacket Creek (a tributary of the Jordan River), and immediately north of the Blue Jacket mine. The workings are of two types. Those confined to quartz leaders intersecting the Excelsior (or Blue Jacket) dyke, and those on Toner's (or the Excelsior) reef. Pl. XXVIII. is a plan of the underground workings.

The Excelsior dyke where cut in the main cross-cut is 25 feet wide. It was followed by a north drive for 275 feet, and just beyond this point an auriferous leader has been worked in the slates on the western wall of the dyke. From this point the drive was continued in the western slates. At 200 feet further a cross-cut was extended 50 feet east, to the dyke, and a promising laminated body of quartz, dipping 63° W., was cut, but was not further prospected. At 200 feet beyond the cross-cut another dyke about 18 inches in thickness was cut, together with a quartz leader dipping 37° S.E. A considerable amount of stoping has been done at this point. The drive was again continued in the western slates of this dyke for a further 175 feet, numerous quartz veins and a spur of dyke being cut.

A cross-cut was then extended 775 feet east. At 150 feet, a dyke 1 foot thick was cut, and at 200 feet, another 10 feet thick. On the former dyke a level was extended south, and some quartz veins were worked; and on the latter a level 265 feet north, and some cross-cutting was done. A level, now collapsed, was also driven south. The ground appears to have been stoped at this point. The remainder of the cross-cut is in solid east-dipping country, except near the end, where a strong wall carrying quartz and pug, and dipping 55° E. was cut. This is evidently Toner's reef, which was worked in the upper ground, but has been cut at too great a distance from its contact with the dyke to prove auriferous.

Toner's (Excelsior) reef is a body of quartz and pug from 2 feet to 4 feet in thickness dipping 49° E. There is a considerable amount of stoping near the surface where the reef is seen in contact, or in close association, with a small dyke, which is either a branch or a faulted portion of the Excelsior dyke.

It is evident from the conditions occurring in this mine that development should be carried out by extending levels and rises on the various dyke bodies, as there is no evidence of gold occurring in any of the lodes at a distance from the dykes.

A considerable amount of the Excelsior dyke in the main level is still unprospected.

The official returns (probably only a small portion of the total) show that 1,656 tons of stone from this mine yielded 1,332 oz. of gold.

### BLUE JACKET WORKINGS.

The Blue Jacket workings are to the south of, and on the same lines of dyke as, the Excelsior mine. For a plan of the underground workings see Pl. XXVIII.

The dyke, which is 10 feet thick, has been worked on both sides of the creek by means of adits, and quartz veins cutting through, and associated with, the dyke have been stoped out. The greater portion of the work has, however, been done from the shaft, which is sunk close to the Blue Jacket Creek, and about 35 feet above its level, at the battery.

As the shaft workings are full of water, I was unable to make an underground inspection, but am informed that the quartz veins worked were in, or close to, the dyke.

In the magazine adit, two dykes have been cut, and it is probable that a series of quartz veins have been stoped in the dykes and in the beds which separate them. Such workings as are open are shown on the plan.

The official returns show that 7,364 tons yielded 4,969 oz. of gold.

### NEW CHUM MINE.

This mine is situated on Dry Creek, a branch of the Jordan River. It has been worked by means of five adits, the crushings from the old mine workings having been taken from the Nos. 1, 2, Wilda's, and Ballarat adits (see Pl. XXIX.).

In Wilda's adit a good section of the lode is exposed. This is, in places, fully 50 feet in width and consists of broken country (mullock) intersected by numerous quartz veins. In places the lode is highly charged with iron pyrites and arsenopyrite.

The reef dips east at 52°, cutting across the slates, which dip 70° E. where seen in the cross-cut. The shoot of gold pitches north at 40° to 45°, and is of no great length or

breadth, being apparently confined to small channels through the large mullocky reef. Toner's shoot of gold is 300 feet south of the main shoot, and had just been discovered at the time when the survey was in progress. The gold pitches north at the same angle as the main shoot, and is confined to some small quartz leaders and mullocky heads an inch or two in thickness. Mr. James Toner crushed 82 tons of stone for 139 oz. 15 dwt. of gold. The shoot of gold has been worked from the surface down to Toner's adit, but has not been picked up in Ray's adit, 218 feet lower. The north drive from Ray's cross-cut should be extended a further 250 feet to intersect on its pitch the gold shoot worked in the old workings. A clean cross-cut should be put east and west for about 30 feet at the point where the gold shoots should be intersected.

### HARBINGER MINE.

The Harbinger mine is situated on the headwaters of Dry Creek, an affluent of the Jordan River. It has been worked to a depth of 500 feet below the outcrop by means of adits, and, according to official statistics, has yielded 8,171 oz. of gold from 12,583 tons of stone crushed. (Pl. XV.)

In common with many other mines in this district, it had been abandoned for many years before the geological survey was carried out, and so much ground in the old workings has collapsed that no entry could be made into many parts of the workings. The available information shows, however, that the Harbinger has been a mine of considerable merit, and that its lodes were similar to those of Victor's Quartz.

The most eastern body worked is a dyke about 10 feet in thickness dipping very slightly west. Associated with this is a considerable amount of lode material, much of which has been crushed. To the west of the dyke, and forming with it an acute angle of about 25°, is the Harbinger reef. This is a well-defined lode dipping slightly west, and varying between 2 feet or 3 feet and 6 feet or 8 feet in thickness. The stopes have collapsed on this reef, but it is apparent that it has been worked down to the lowest adit-level.

There appears to be every justification for the re-opening of such a mine as the Harbinger; but, to carry the probability of success, the policy of driving long and costly adits to secure, at most, a couple of hundred feet of backs, must be abandoned in favour of shaft-sinking. In this case, as in the others enumerated, a vertical rise should be put through the old ground to the surface, and be followed by shaft-sinking from the lowest adit-level.

### HOLY TERROR REEF.

The Holy Terror reef is a small body of stone a few inches in thickness traversing the coarse fossiliferous rock known as the Holy Terror grit. It is about 2 miles north-east of Red Jacket. The shoot of gold is very short, but exceedingly rich, 29½ tons of stone yielding 278 oz. 8 dwt. of gold. There have been some later crushings than the above, but I have not got the actual returns. The mine is still working.

### VICTOR'S QUARTZ MINE.

The Victor's Quartz workings are situated on the southern fall of a high range between Ross's and Red Jacket Creeks. The line of reef and dyke were worked in the early days of reefing in this district, one of the main claims on the line being known as the Defiance. Later it was re-prospected by Messrs. Thomas and Jacob Victor and others, and the remunerative gold shoot to which the mine owes its name was discovered by them. It was then floated into a public company of 32,000 shares at 5s., and during the four or five years it was in active work, 42,634 tons of lode were crushed for 24,193 oz. of gold, and dividends to the amount of £30,800, or 19s. 3d. per share, were paid to shareholders.

The main workings are by means of adits known as Nos. 1, 2, and 3. No. 3 adit is about 525 feet below the outcrop of the reef. A plan and sections are given in Pl. XXX.

The lode operated upon is a mullocky body varying between 3 feet and 30 feet or 40 feet in thickness, and underlying east at an average angle of 65°. The shoot of gold down to No. 2 level was a little over 200 feet in length. At the northern end of the auriferous shoot, the lode intersected and faulted a dyke from 2 to 5 feet thick, of the usual diorite type (Fig. 10). The shoot of gold apparently pitches north along the line of contact of dyke and reef.

Above No. 2 level the reef and portion of the dyke are entirely stoped out, most of the gold mentioned above having come from this ground.

As the reserves became exhausted above No. 2 level, a lower adit-level was put in a distance of 1,425 feet to cut the reef-channel 250 feet below No. 2 level. Numerous quartz reefs were cut in the new adit, and for several months the company operated upon the wrong reef. The length of time occupied in driving the cross-cut, together with the numerous delays in locating the proper lode-channel, appear to have discouraged shareholders, and the only work done at No. 3 adit-level was to extend a level north for 400 feet and to connect No. 3 level with No. 2 level at a point considerably south of the shoot of gold.

The results obtained in the upper levels of this mine justify further prospecting at and above No. 3 level. According to the survey, it is doubtful if the last 200 feet of the north level have been driven on the channel of Victor's reef; in fact, it is probable the drive has been diverted along one of the numerous reef-channels which branch from Victor's reef. In my opinion, a cross-cut should be extended east for 75 feet from a point 300 feet north of No. 3 cross-cut, and, in the event of a lode-channel being intersected between 50 feet and 75 feet, that it be driven on north for at least 200 feet. No. 3 level should be connected with No. 2 level at a point at least 400 feet north of the main cross-cut.

Towards the close of operations by the old company, the mine was taken over by Mr. Harry Hill, and a winch-shaft was sunk from a chamber in No. 3 cross-cut at a point 150 feet east of Victor's reef. The reef, which varied from 2 feet to 6 feet in thickness, was prospected to a depth of 135 feet. The shoot of gold worked from this shaft is clearly the downward extension of that worked by the South Victor's company above No. 3 adit-level, and is not directly connected with the main Victor's Quartz shoot.

In several parts of the Victor's Quartz reef-channel, but more particularly in the South Victor's level, highly carbonaceous matter resembling anthracite or graphite occurs. This material varies from a few inches to 18 inches in thickness.

### SOUTH VICTOR'S MINE.

The South Victor's company was formed to exploit the ground south of Victor's Quartz mine, at the time the latter was on the dividend-paying list. A long cross-cut adit, driven from the north (Ross' Creek) side of the range, intersected the reef at a point 75 feet above Victor's No. 3 adit. A small shoot of gold was cut, from which 470 tons yielded 716 oz. of gold. This shoot is the same as that worked in Victor's Quartz winch-shaft. The reef varies between 1 foot and 6 feet in thickness, and is accompanied in places by upwards of 18 inches of the carbonaceous material mentioned under the last heading. A sample from the main level was analyzed in the Geological Laboratory, with the following result:—

| | per cent. |
|---|---|
| Carbonaceous matter .. | 75.5 |
| Silica .. .. .. | 16.0 |
| Alumina and iron.. .. | 2.0 |
| Magnesia .. .. | Trace |
| Lime .. .. .. | 2.0 |
| Moisture .. .. .. | 4.5 |
| | 100.0 |

No volatile hydrocarbons were found.

### VICTOR'S EXTENDED MINE.

This mine is at the south end of the Victor's Quartz dyke, which here ranges between 2 feet and 5 feet in thickness. In several parts the lode-channel is occupied more by quartz than by dyke. Very little work has been done, but 82 tons of stone crushed yielded 139 oz. 15 dwt.

### MCINTYRE'S QUARTZ MINE.

This mine is situated immediately on the north-east bank of Ross's Creek, and was discovered by Mr. Donald McIntyre in 1902 during the period of mining activity following the payment of regular dividends by the adjacent Victor's Quartz company. It was anticipated by the early alluvial miners that a reef existed in this locality, as a considerable enrichment had occurred in the alluvial gold workings at this point; but considerable credit is due to the prospector for the discovery, as the reef was hidden by a capping of wash and shingle several feet thick, and was covered with very thick scrub.

In 1902 the mine was floated into a no liability company, with Mr. John Stackpoole as mine manager. The initial mining difficulties were very great, on account of the heavy growth of timber and the proximity of the outcrop to Ross's Creek.

Eventually, however, an underlay shaft was sunk on the reef to a depth of 185 feet, and levels were opened out at 90 feet and 185 feet, but very little work was done at the latter level. (Pl. XVI.)

The total yield of gold was 1,346 oz. from 1,874 tons.

### PHEASANT TAIL (NORTH MCINTYRE'S) MINE.

The Pheasant Tail reef is situated on the northern slope of Ross's Creek, and, like the adjoining mine, McIntyre's Quartz, was discovered by Mr. Donald McIntyre. For plan and section see Pl. XXXI.

It is a parallel line east of McIntyre's Quartz, and is south of, and approximately on the same line as, the Valentine reef, which had been worked many years earlier. The reef dips east at 75°, and the shoot of gold pitches north. On the surface it was small, not exceeding 6 inches in thickness, and the auriferous shoot was about 10 feet in length. The initial crushing returned 11 oz. per ton. The shoot was followed from the surface by means of a shaft for about 65 feet, and then it was lost, and the mine was abandoned. From the shaft workings, 78 tons of stone crushed yielded 234 oz. 16 dwt.

A few years later the mine was re-prospected by Mr. E. George and son, and the shoot of gold was picked up a few feet away from the old workings. The reef was stoped back to the shaft from No. 1 adit-level, and was then followed down by means of an underlay shaft. Subsequently, at a depth of 170 feet below No. 1 adit, a new adit (No. 2), 700 feet in length, was pluckily driven by this small party, with the aid of a grant under the Mines Development Act. The shoot of gold was picked up in the adit-level and was found to have increased to 60 feet in length; the reef had also widened to 15 inches or 18 inches.

The first 29 tons of stone crushed by this party yielded 138 oz. 6 dwt., or at the rate of 4 oz. 15 dwt. of gold per ton. To date 441 tons have been crushed for 583 oz. of gold. The party is still breaking payable stone over No. 2 level, but with the exhaustion of the ore overhead, they will be faced with the shaft-sinking problem.

### REPUBLIC MINE.

The workings are situated on the eastern side of the Goulburn River, opposite the township of Wood's Point. The mine has been opened by means of shallow tunnels and shafts. The reef-channel is from 1 foot to 3 feet wide, and is formed on the bedding planes, which at the surface dip westerly, but at 50′ feet below the surface dip easterly. The reef makes numerous rolls or pitches in a general northerly direction, and it is upon the "shoulders" thus formed that the richer patches of gold have been found.

The reef has a sandstone footwall and a slate hanging wall, and strikes north-westwards in the prevalent direction of the enclosing Silurian rocks. The structural conditions are very similar to those of the Star of the West at Kevington, and the two mines, although widely separated, are evidently in the same geological horizon. Antimonial ore occurs to the east of the Republic line of reef, near where the battery was erected on Republic Creek. The various claims on the Republic line were known as the Bushman's or Satellite, the Revival, and the Myrtle. To 1888, 229 tons of stone was crushed for 653 oz. 9 dwt. of gold, and probably another 100 oz. has been obtained since.

### BALMORAL MINE.

This mine is situated just under the crest of the Main Divide, at the extreme head of the left-hand branch of Gooley's Creek. Two reefs have been operated upon, the shoot of gold occurring near their junction. One reef about 1 ft. 6 in. thick strikes north and south, and dips east; this evidently faults the other reef, which strikes at an oblique angle to the former. The shoot of gold has been worked down from the surface to below No. 1 level, but has not been picked up in No. 2 adit. There is room for further prospecting in this mine. I have not the returns of crushing, but I saw very rich stone broken from the stopes.

### GARIBALDI MINE.

This mine is situated just under the southern crest of the Main Divide, to the east of the township of Matlock, and has been worked by means of a shaft and an adit to a depth of 200 feet. The lode-channel averages about 2 feet in width

and is nearly vertical, cutting across country dipping about 70° E. It is chiefly interesting from the fact that the upper portion of the channel was occupied by a quartz reef, with which was associated carbonates of lime and magnesia, while in the lower levels the quartz reef was replaced by dyke. The shoot of gold appears to have been a short one, and has been stoped back to the surface from the adit-level. (Pl. XVII.)

The only official return of crushing that I can find is 598 tons for 237 oz. of gold.

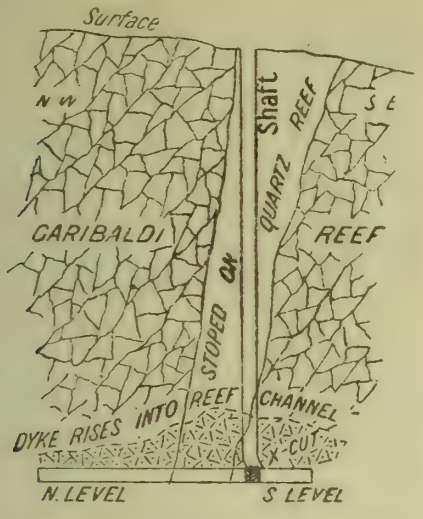



FIG. 11. Longitudinal section, Garibaldi Reef.

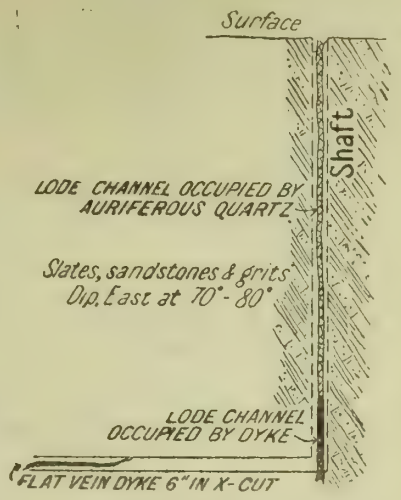



FIG. 12. Cross Section, Garibaldi Reef, looking north.

Scale: 90 feet to 1 inch, approximately.

### ARGYLE MINE.

The workings of this mine are on the Argyle dyke and an associated reef. It is situated south of the Jordan River, about a mile south-east of Jericho. The dyke is about 3 feet in thickness, and the reef averages about 6 inches and dips west, while the auriferous shoot pitches south. The workings were carried on first by means of an adit about 80 feet above the Jordan River, and later by a shaft 200 feet in depth. The richest crushing from this mine appears to have been 100 tons for 112 oz. 19 dwt., while 345 tons yielded 178 oz. 5 dwt.

### B.B. QUARTZ MINE.

The B.B. quartz mine is situated on the B.B. Creek, which is generally considered the richest creek for alluvial gold on the Gippsland fall of the Main Divide. The mine workings are about 20 chains above the hamlet of Jericho. (Pl. XXXII.)

The workings are by means of adits to the level of B.B. Creek, and then by a shaft sunk from a chamber in No. 3 adit. The shaft workings being full of water, have not been available for inspection during my residence in the district. The adit workings, however, are in sound order, and afford a good section of the lode. The reef varies between a few inches and about 2 feet in thickness, and is of the type of true fissure lodes—apparently having been formed on a fault plane which fractured the slate country adjacent to the large intrusions of dyke matter known as the B.B. dyke. Although near the large B.B. dyke, no dyke material can be seen in actual association with the reef.

The strike of the reef coincides with that of the enclosing beds, but while the latter dip 78° E., the reef dips 75° W. The total length of the shoot of gold is about 150 feet, with some intervening blank ground. The shoot, or shoots, pitch north.

The official returns show that 2,076 tons crushed yielded 1,768 oz. of gold. This mine appears to have paid fairly well, but in the latter stages work in the shaft workings was greatly hampered by inefficient machinery.

### CREIGHTON AND WHITE'S AND COYLE'S REEFS.

To the south of the B.B. quartz workings two reefs, known as Creighton and White's and Coyle's, were worked on the contact of the B.B. dyke and the south-eastern slates. These are well-defined bodies of quartz 12 inches to 18 inches thick, having a dyke footwall and a slate hanging wall, and dipping south-east at about 45°. Crushings are said to have approximated about 1 oz. of gold per ton, but the reefs have been worked only to shallow depths in consequence of their proximity to the Jordan River.

During the progress of the survey Messrs. Bennett and Sons were engaged in hydraulic sluicing in the bed of the Jordan River, and while stripping that portion flowing over the outcrop of the B.B. dyke, three new reefs were disclosed. These varied from 6 inches to 12 inches in thickness, and were sunk on for a few feet. Coarse gold could be seen in the stone, but, owing to their position in the bed of the Jordan River, and to the absence of pumping machinery, no further work has been done. To the north of these reefs a well-defined lode-track can be seen which is approximately on the line of the B.B. quartz; within a few feet of this, nuggets of 37 oz. and 80 oz. (in addition to many smaller pieces of gold) were obtained.

I have fixed by survey the position of these reefs, so that, should necessity arise, they can be re-located under the alluvial debris.

### NEW LOCH FYNE MINE.

The New Loch Fyne workings are situated at the extreme head of B.B. Creek, on the Gippsland slope of the Main Divide, below Matlock township (Pl. XXXIII.) A great portion of the rich alluvial gold of the B.B. Creek was, no doubt, derived

from the wearing down of the dyke outcrop. The great dimensions of this dyke-bulge were not anticipated in the earlier stages of the mine, in consequence of the deep covering of soil and undergrowth which disguised it.

Numerous small parties operated the mine with fair success until 1886, when the great possibilities being recognised, it was decided to float it into a no-liability company, which was eventually formed in January, 1887. Since that period the following returns have been received, and payments made, by the company:—

Ore treated, 117,930 tons;
Gold yield, 85,963 oz. 11 dwt.
Value, £303,936 14s.
Dividends, £109,000.
Wages, £139,892.
Firewood, £15,685 14s.
Mining requisites, £35,624 13s.

The dyke-bulge is approximately 700 feet long by 100 feet to 280 feet wide. The reefs range between 1 foot and 6 feet in thickness, and usually strike along the eastern wall of the dyke and dip towards the western wall, which, however, they seldom quite reach. The transverse sections (Pls. XVIII. to XXV.) taken at every 100 feet along the dyke illustrate the occurrence of the various reefs.[1]

From the surface to a depth of 325 feet, the various reefs were worked by adit. Below this (No. 3 level) a shaft was sunk from a chamber in the eastern slates to a depth of 106 feet, and, at 100 feet, No. 4 level was extended, and two of the reefs worked in the upper ground were stoped. A double horse tunnel was then driven a distance of 1,968 feet and connected with the shaft below No. 4 level. The new level was called No. 5, and is 106 feet below No. 4 level. Only three small quartz floors were obtained in this section of the dyke; 1,672 tons crushed from these yielded 991 oz. 10 dwt. of gold, valued at £3,479 19s. 1d.

As will be seen from the sections, auriferous reefs have been continuously worked from the surface to the bottom level, a vertical distance of over 500 feet. There can be no reasonable doubt that the system of auriferous reefs continues below No. 5 level, and that the sinking of the shaft below No. 5 level will place the mine on the list of regular gold producers.

In the lower levels many parts of the dyke are more hornblendic than in the upper levels, and such portions show a considerable amount of copper pyrites. I observed the similarity of parts of the dyke to other dykes known to contain platinum, when visiting the mine with the Hon. Peter McBride, and induced the mine manager (Mr. James Trevor) to forward hornblendic samples to the Geological Laboratory to be assayed for platinum. The following are the results:—

| Assay Number. | Position. | Gold. | | | Silver. | | | Copper. | Platinum. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. | dwt. | gr. | oz. | dwt. | gr. | Per cent. | oz. | dwt. | gr. |
| 228 (1910) ... | Bottom level ... | 0 | 0 | 6 | 0 | 2 | 3 | 0·71 | 0 | 0 | 14 |
| 112 (1911) ... | No. 4 level .. | 0 | 0 | 19 | 0 | 4 | 1 | 1·1 | 0 | 1 | 2 |
| 119 (1911) ... | Various parts of the dyke | 0 | 0 | 19 | 0 | 4 | 9 | 1·0 | 0 | 0 | 18 |
| 469 (1911) ... | | 0 | 0 | 16 | 0 | 2 | 7 | 0·65 | 0 | 0 | 16 |
| 470 (1911) ... | | 0 | 4 | 22 | 0 | 16 | 14 | 4·94 | 0 | 3 | 18 |
| 242 (1913) ... | | 0 | 1 | 0 | Trace | | | 1·8 | Trace | | |

[1] These transverse sections were prepared by the mine manager, Mr. Trevor.

# APPENDIX.

## NOTES ON THE PETROLOGY OF SOME IGNEOUS ROCKS FROM THE WOOD'S POINT DISTRICT.

*By Professor Ernest W. Skeats, D.Sc., A.R.C.Sc., F.G.S., University of Melbourne.*

### Introduction.

The rocks described in this report were collected by Mr. O. A. L. Whitelaw during his survey of the district, and belong to two widely separated big geological periods, the Upper Palæozoic and the Kainozoic respectively. Neither time nor material for a complete petrographic study has been available, and no analyses of the rocks have been made. Among the specimens submitted for report, dykes, lavas, and pyroclastic rocks are all represented.

Propylitized diorite and porphyrite dykes (Lower Devonian?)—

Among the igneous rocks of the district, Mr. Whitelaw, from their field relations, places as the oldest the economically important series of propylitized diorite and porphyrite dykes. The only rocks of this series described below are a few specimens from the New Loch Fyne mine, near Matlock.

Lavas and pyroclastic rocks of the Snowy River Porphyry series? (Lower Devonian?)—

Two outcrops occur, and several rocks from this series are described below.

Acid lavas and pyroclastic rocks and melaphyres (U. Devonian or L. Carboniferous?)—

Representatives of each of these types are described below.

Basic dykes (Lower Kainozoic?)—

No rocks of this series have been submitted for examination, unless a coarse-grained type from Connor's Plain may represent a plug connected with these dykes.

Basalts (Miocene?)—

Rocks from the elevated basaltic plateau of Connor's Plain and of Spring Hill are described.

### The Propylitized Diorites and Porphyrites (Lower Devonian?)

These are the gold-bearing series. Their petrological characters in the Wood's Point district have been described by Mr. Mennell[1] and by Professor Gregory[2]. These dykes are probably apophyses of buried grano-diorite masses, probably of Lower Devonian age. They trend roughly N.W. and S.E. across the area, and are intruded into the Walhalla beds of the Upper Silurian series, but run roughly parallel to the strike of the latter beds. At intervals along the lines the dykes expand to big "dyke bulges," where the principal mines are situated. One important line of dyke includes the Morning Star (Wood's Point), Comet, Little Comet,

[1] Mennell. Geol. Mag., 1902, pp. 392-396.

[2] Gregory. Appendix to the Wood's Point Gold-field, by O. A. L. Whitelaw. Mem. No. 3, Geol. Surv., Vict., 1905, pp. 30-34.

and Shamrock mines, while about 3 miles south-westerly across the strike is another line of dyke passing through Matlock, on which are situated the All Nations and New Loch Fyne mines. The practical limitation of the important gold occurrences to the propylitized dykes or their immediate neighbourhood warrants a brief discussion of this peculiar type of alteration.

### Propylitization, Sericitization, Carbonatization, and the Formation of Gold Quartz Veins.

Mr. Mennell[1], in his petrological description of the Wood's Point dyke, while describing the peculiar alterations of the dyke, did not refer them to propylitization. He did not believe that the gold in the quartz veins had been derived from the dyke magma, but suggested that it came from minute quantities of gold present in the adjoining shales, and that it was leached out of the shales and redeposited in the quartz veins by the action of heated acid waters connected with the intrusion. At the same time, he pointed out the association of the gold with a rock containing original hornblende, and seemed to think that this association might be significant since it occurs also in New South Wales.

Professor Gregory[2], in his description of the dykes on the Morning Star line, between the Little Comet mine in the south and the A1 mine near Gaffney's Creek to the north, showed that all the dykes had suffered more or less mineralogical alteration, clearly recognized that propylitization had occurred, but only applied the term propylitic to those rocks which were most altered. Professor Gregory evidently pictured the gold as having been introduced into the quartz veins during and as a result of the process of propylitization, since he states, "It is therefore probable that the gold will be found most in the diorites where the propylitization has been most thoroughly effected." Mr. N. Junner, B.Sc.[3], one of my former students, has recently studied the Wood's Point district, and also the Queenstown and Diamond Creek gold-fields, near Melbourne, where closely similar gold-bearing dykes similarly altered are intruded into the Silurian sediments. He has paid particular attention to the problems of propylitization, sericitization, carbonatization, and the relation of these to the formation of the gold-quartz veins, and has come to some important and suggestive conclusions. Accepting Vogt's[4] definition of propylitization as a solfataric and thermal alteration effected by attacks of hydrogen sulphide or alkaline sulphides, and often of carbonic acid, and also Kirk's[5] statement of the various alterations of rocks produced as the result of propylitization, Mr. Junner summarizes these changes as follows :—

*Chemical Alterations.*—Iron gained, sulphur added to form pyrite, losses in lime, magnesia, and soda; change of iron oxides to sulphides; decreases in all bases except potash; gains in iron sulphide, silica, water, alumina, potash, &c.

*Mineral Alterations.*—Development of sericite, quartz, pyrite, chlorite, epidote, rutile, &c. Femic minerals are first altered and felspars are more resistant.

*Physical Alterations.*—Increase of density.

### Three Types of Alteration of the Dykes.

Mr. Junner's studies of the Wood's Point and Queenstown areas led him to the important conclusions that three types of alteration are recognisable in the dykes, namely :—

1. *A regional propylitic alteration* during or immediately after the consolidation of the rock at relatively high temperature and pressure. The alteration is caused by gases or solutions containing water, carbon dioxide, and sulphides, and results in the formation of chlorite, epidote, leucoxene, carbonate, pyrrhotite, and a little sericite. (Pyrite is also produced by this alteration. E.W.S.)

2. *Hydrothermal alteration* near the walls of the gold quartz veins at much lower temperature and pressure than in case No. 1. The alteration is caused by solutions containing alkaline carbonates and sulphides, and results in extensive sericitization and carbonatization, and in the disappearance of the femic minerals, hornblende, chlorite, and pyrrhotite, and their replacement by muscovite, carbonates, and pyrite.

3. *Surface decomposition* by present day vadose solutions. Kaolinization is referable to the action of these solutions.

### Relation of Dyke Alterations to Gold Deposition.

Junner maintains that the regional propylitization of the rocks is independent of the vein solutions, and the effects of the latter are superimposed on the propylitization effects. My own study of the rocks leads me in the main to agree with Junner's conclusions. The introduction of the gold into the veins, according to this view, was not effected during or as a result of the propylitic changes in the dykes, but was due to the subsequent passage of solutions, presumably magmatic in origin, of auriferous, siliceous, alkaline carbonates and sulphides. These, rising along the shrinkage cracks or fractures in the dykes, filled them, formed the gold quartz veins, and produced sericitization, carbonatization, and pyritization of the dykes only in the immediate vicinity of the veins. The widespread decomposition of the dykes down to about water level is the result of quite recent downward circulation of superficial waters, acid in character, as the result of oxidation of the pyrites. This last change may have led to some migration in the gold contents of the veins, and produced some secondary enrichment, but is, of course, quite unrelated to the solutions concerned in the primary deposition of the vein materials, which, being presumably magmatic, are deep seated in origin. The deposition of the gold in the quartz veins is, therefore, not a superficial phenomenon, but may be expected to continue in depth. This view has been demonstrated to be correct by recent experience in the A1 mine near Gaffney's Creek, where rich gold is being obtained from the deepest levels at 900 and 1,000 feet.

### Revision of Classification of Dyke Rocks from Wood's Point.

Bearing in mind these conclusions with regard to the three types of alteration of the dykes, and in view of the evidence in favour of the introduction of the gold during the second type of alteration involving sericitization, carbonatization, the introduction of pyrite and the extensive removal of hornblende and chlorite, I have re-read the descriptions of the rocks examined by Professor Gregory, and re-examined the rocks and rock sections, and think that certain modifications in the description and classification of the rock series are advisable. In view of the various senses in which the terms propylite and propylitic have been used, I recognise that some ambiguity attaches to these terms. While some geologists believe the chloritic and sericitic phases of alteration merge into each other, others have given reasons for believing the sericitization and carbonatization to be a subsequent change to chloritization, and Junner's work emphasizes the latter view. If one accepts Vogt's[1] definition of propylitization, however, it seems to me that all the dyke rocks described by Professor Gregory should be regarded as propylitized, and not simply the more altered rocks to which he restricted the term. Among the more altered rocks which Professor Gregory has described as propylitic diorites are some in which carbonates and sericite are extensively developed. Among these I would include Nos. 763, 765, and 767 from the A1 mine near Gaffney's Creek, No. 768 from the A1 mine south, Gaffney's Creek, No. 771 from the Little Comet mine, and No. 770 from the May Moon dyke, All Nation's mine, Matlock. In all of these rock sections carbonate and sericite are abundantly developed. The exact positions in relation to the quartz veins of the rocks from which the above specimens were taken is not stated, but, in view of their mineral characters, notably the development of sericite, carbonate, and pyrite, and the considerable removal of hornblende and chlorite, it seems probable that they have suffered, not only propylitization, but also hydrothermal alteration by vein solutions. It is, perhaps, also significant of their origin that these rocks are lighter in colour than the remainder, and appear to have undergone more or less bleaching, such as Junner describes as characterizing rocks altered by the vein solutions in the proximity of the mineral veins.

### Description of Rocks from the New Loch Fyne Mine, Matlock.

The rocks are not precisely localized. The numbers refer to the rock sections in the collection of the Geological Survey.

No. 1415. A moderately coarse-grained, holocrystal line rock, black and white in colour in hand specimen Specific gravity—2.93.

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[1] Mennell, op. cit.
[2] Gregory, op. cit.
[3] Junner. (*a*) General and mining geology of the Diamond Creek area, Proc. Roy. Soc. Vict., vol. XXV. (new series), pt. 1, 1913, pp. 340-342 and 349-350. (*b*) Petrology and mining geology of the country near Queenstown, Proc. Roy. Soc. Vict., vol. XXVII. (new series), pt. 1, 1914 pp. 119-149. (*c*) Petrology of the igneous rocks near Healesville and Narbethong, Proc. Roy. Soc. Vict., vol. XXVII. (new series), pt. 2, 1915, pp. 279-280.
[4] Vogt. Genesis of ore deposits. Trans. Amer. Inst. Min. Eng., 1901, p. 668.
[5] Kirk. Economic Geology, Vol. XX., No. 1, 1912, pp. 35-82.

[1] Vogt., op. cit.

Under the microscope it is seen that the texture is somewhat porphyritic. The most prominent mineral is a brown hornblende partially changed to chlorite. Many of the hornblende crystals are idiomorphic. Porphyritic crystals of plagioclase showing zoning and lamellar twinning are more or less cloudy through alteration. There is a small amount of interstitial clear orthoclase, possibly of secondary origin. In addition, clear areas of quartz appear to represent late crystallization, and are intergrown in places with a few rather large plates of calcite, which are quite distinct in character from the irregular-shaped dusty patches of that mineral occurring in rocks which have suffered sericitization and carbonatization. Among the accessory minerals are ilmenite, leucoxene and long rods of apatite. What appears to have been originally a ground mass has, probably as one of the effects of propylitization, recrystallized as a micrographic intergrowth of quartz and felspar. The special effects of propylitization are noticeable in the extensive development of abundant chlorite, the variety pennine, at the expense of the hornblende, the bleaching of some of the hornblende to pale actinolite and colourless tremolite, the development of epidote, a little sericite, and some pyrite.

The rock may be described as a propylitized quartz hornblende diorite.

No. 1710. This rock is generally similar to No. 1415. There is the same mineral development, and only special points need be noted. In places, altered porphyritic plagioclase crystals are enclosed by brown hornblende. Some brown hornblende crystals have a green margin of actinolite. The felspars range from oligoclase to labradorite, and the quartz has developed a pseudo cleavage, indicated by straight cracks in places passing into curved cracks. There is abundance of pennine, and much more pyrite than in No. 1415. The micrographic intergrowth of quartz and felspar is conspicuous in the altered ground mass. Very little sericite has been developed, but it would appear that the rock comes from one of the upper levels in the mine within the limits of the action of descending superficial waters, since a good deal of kaolin has developed and rendered the felspars turbid through decomposition. The rock is a propylitized quartz hornblende diorite.

No. 1711. From the north end of the mine. This rock is generally similar to the two preceding specimens. One notes the green actinolite border to the brown hornblende, the relative abundance of ilmenite, with its alteration products, leucoxene and granular sphene. Some chlorite occurs developed in felspar crystals along the cleavage planes. As compared with No. 1710, there is present in the rock rather larger quantities of hornblende, sericite and pyrite.

The rock is a propylitized quartz hornblende diorite.

No. 1712. From the south end of the mine. This rock differs considerably from those previously described, both in its original mineral contents and in the nature of the alterations it has undergone. It is rather coarser in grain than the others. The original minerals appear to have been brown hornblende, ophitically enclosing crystals of biotite, ilmenite, and large crystals of felspar, the majority originally plagioclase with a little orthoclase. Propylitization, and subsequent sericitization and carbonatization, have affected the rock, with the result that chlorite, leucoxene, and metallic sulphides, both pyrite and chalcopyrite, and possibly pyrrhotite were formed, the biotite has been more or less completely bleached and now is represented by pseudomorphs, partly of chlorite, partly of a white micaceous aggregate. The larger plagioclase crystals are now almost completely sericitized and carbonatized. No quartz is recognisable in the section. In the process of alteration lenticles of carbonate have formed between the cleavage planes of the biotite, and secondary minute crystals of magnetite are dotted over the surface of the biotite pseudomorphs, and are developed along the cleavage planes of the partially altered hornblende.

The rock may have been originally a biotite hornblende diorite, but it is now difficult to identify precisely because, apart from the effect of propylitization, it appears to have been further altered by the passage through it of solutions from the mineral veins to which the extensive development of sericite and dusty carbonates is probably to be attributed.

The resemblance between these rocks from the New Loch Fyne mine and those of the Wood's Point mines, and of the A1 mine at Gaffney's Creek, is remarkable. The field occurrence, the original mineral composition and rock texture, and the various alteration products induced by propylitization, sericitization, and carbonatization, can be paralleled from rocks and rock sections from these two distinct lines of dykes.

## Lavas and Pyroclastic Rocks of the Snowy River Porphyry Series? (Lower Devonian?)

Mr. Whitelaw groups with the Snowy River Porphyries, of probably Lower Devonian age, a thick series of lavas, agglomerates, and tuffs occurring in the eastern part of the area mapped. Two separate areas are shown on Mr. Whitelaw's map lying to the west of the main outcrop of the Upper Palæozoic sediments and igneous rocks, and resting on the Mount Useful series of the Lower Silurian sediments. Dr. Howitt[1] has given a partial petrological description of the Snowy River series from the type area. As andesitic rocks are represented in this series it is possible that such types may be correlated with the Lower Buchan series of igneous rocks of Middle Devonian age described by the late Dr. Howitt,[2] and referred to by myself.[3] The two areas shown on the map may be referred to as the Fullarton's Spur area and the Serpentine Creek area respectively. Rocks from each of these areas are described below.

### Rocks from Fullarton Spur.

No. 957. A dense, dark, compact bluish rock. Specific gravity 2.86. Under the microscope the texture is seen to be porphyritic. Irregular structural lines crossing the section might represent the flow lines of a lava, the banding of a tuff or shear zones. The setting of the porphyritic crystals at various angles to these structural lines is suggestive of pyroclastic structure, but evidence of recrystallization under crushing is abundant in the fibrous fringes of secondary actinolite developed at the edges of the colourless porphyritic augite crystals. Phenocrysts of plagioclase ranging from oligoclase to andesine are partially altered to sericite. The groundmass is microfelsitic, and consists of quartz and felspar. The rock is probably a sheared and recrystallized augite andesite tuff. The above description is fairly applicable also to Nos. 958, 959, 960, and 967, but special features will be noted.

No. 958. A bluish rock, with evidence of shearing in development of a somewhat fissile character. Specific gravity=2.66. Under the microscope further alteration of the pale augite to carbonates and fibrous actinolite is noticeable. The felspars have been converted into a mixture of sericite and carbonate, and there is evidence of some secondary silicification of the ground mass. The rock is probably a sheared augite andesite tuff.

No. 959. A dark blue compact somewhat porphyritic rock. Specific gravity = 2.65. Under the microscope porphyritic crystals of plagioclase (oligoclase to andesine) and colourless augite are abundant; some of the augite has been changed to fibrous hornblende. The ground mass consists of minute felspars, laths and a little quartz occurring in irregular blebs.

The rock is a lava flow, and may be described as an augite andesite.

No. 960. Bluish, crushed, fragmental rock. Specific gravity = 2.56 Under the microscope the characters are similar to No. 957, and the rock may be described as a crushed augite andesite tuff.

No. 967. Brownish porphyritic, somewhat cellular lava. Specific gravity = 2.56. Under the microscope this rock is seen to be similar to No. 959, and is an augite andesite.

The remaining rocks from Fullarton's Spur, namely, Nos. 954, 965, 966, and 968, appear to be rhyolitic in character.

No. 954. From 20 chains N.E. of Tollgate. In hand specimen part is dark, dense, and silicified, the remainder lighter in colour, cavernous, and apparently desilicified. Specific gravity = 2.21. In this section the rock has the characters of a banded chert with chalcedenic silica and regular-shaped cavities from which crystals have been dissolved. The rock is probably a silicified rhyolite ash.

No. 965. In section the rock shows flow structure, carbonates are present and the rock is very fine grained, consisting mainly of felspathic ground mass. It is probably a fine-grained lava, and may be either a rhyolite or acid andesite.

No. 966. A dense, banded, silicified rock. Specific gravity = 2.52. The rock is similar to No. 965, and may be either a rhyolite or acid andesite.

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[1] Howitt. Notes on the Devonian rocks of N. Gippsland. Geol. Surv., Vict., Prog. Rep. III., 1876, pp. 181-249.

[2] Howitt. (*a*) Prog. Rep. II., Geol. Surv., Vict., 1878, pp. 117-147. (*b*) Trans. Roy. Soc., Vict., vol. XVIII., 1882, pp. 7-39. (*c*) Trans. Roy. Soc. Vict., vol. XXI., 1885, pp. 101-105.

[3] Skeats. Pres. add. sect. C, Aust. Assoc. Adv. of Science, Brisbane, 1909 pp. 194-196.

No. 968. A pale, silicified, fine-grained rock. Specific gravity = 2.45. Under the microscope a banded or flow structure is noticeable, no phenocrysts are developed, and the rock consists of micro-crystalline to cryptocrystalline aggregates of quartz and felspar. The rock is probably a devitrified rhyolite.

### Acid Lavas and Pyroclastic Rocks and Melaphyres (U. Devonian or L. Carboniferous?)

Interbedded with the Upper Palæozoic sediments in the eastern part of the area mapped, and generally occurring near the base of the series, are relatively acid lavas, agglomerates, and tuffs, and thin bands of basic lavas or melaphyres. Rocks of this series from the districts of Mount Wellington and Snowy Bluff have been described by Dr. Howitt[1] and Mr. Thiele[2], and have been referred to by myself.[3]

Nos. 969 and 971 belong to the acid, Nos. 964, 970, and 972 to the basic series.

No. 969. Glencairn Creek. A dark, banded silicified rock. Specific gravity = 2.57. In section it is seen to be a devitrified lava with an irregular banded structure suggesting flow. It consists mainly of a minute quartz and felspar mosaic with bands of minute black opaque patches of magnetite. The rock is probably a silicified or devitrified rhyolite.

No. 971. Barkly River. A greyish compact rock with porphyritic crystals. Specific gravity = 2.55. In section oligoclase phenocrysts are abundant, and chlorite is distributed through the rock, while sericite and finely granular quartz occur in the ground mass. The rock has a fragmental structure, and is probably a sheared and recrystallized rhyolite tuff.

No. 964. Barkly River. A dark compact, banded rock. Specific gravity = 2.73. In section there is an abundance of small porphyritic crystals of pale augite, many being changed to fibrous hornblende. Oligoclase phenocrysts have been party sericitized, while some have recrystallized; chlorite and quartz are recognized in the ground mass. The alteration and recrystallization of the minerals of the rock, probably under pressure, is of the character which, when complete, would give rise to an epidiorite. The rock may, however, be described as an altered augite andesite, but in the field these rocks have been known as melaphyres.

No. 970. Barkly River. A dense bluish-green rock. Specific gravity = 2.86. In section the rock is similar to No. 964, but shows a greater development of needles of secondary hornblende, and a more complete recrystallization of the plagioclase phenocrysts. The rock is an altered augite andesite.

No. 972. Barkly River. A dense greenish rock. Specific gravity = 2.66. A similar rock to No. 964, but showing rather less evidence of alteration of the augite and felspar phenocrysts. Green chlorite is, however, present in some quantity. The rock is an augite andesite.

### Crushing and Recrystallization of the Upper Palæozoic Igneous Rocks.

One of the difficulties in the identification of the igneous rocks described above, referred to the Snowy River Porphyry and to the Upper Devonian or Lower Carboniferous interbedded series, lies in the extent to which secondary crystallization has proceeded. This appears to be due to crushing movements affecting the rocks. It is, perhaps, significant that Mr. Whitelaw says that in traversing the area mapped from W. to E. the Silurian sediments gradually show more and more signs of crushing and alteration. As the igneous rocks described above come from the eastern part of the area, it would appear either that such crushing movements were of post Upper Devonian or Lower Carboniferous age, or that such movements commencing at an earlier period persisted until after the Upper Palæozoic sediments and associated igneous rocks had been laid down.

### Basic Dykes (L. Kainozoic).

Certain basic dykes occur in the eastern part of the area mapped. They intrude the Upper Ordovician and also the Mount Useful series of the Lower Silurian sediments which, according to Mr. Whitelaw's field evidence, they appear to have metamorphosed. They appear to be older than the older basalts of the plateaux, but Mr. Whitelaw believes that they belong to the same period of igneous activity. If so, they are of Kainozoic age. No rocks of this series have been submitted for examination, unless a coarse-grained type from Connor's Plain may represent a plug connected with these dykes. It is described, however, under the basalts.

### Basalts (Miocene?)

The remaining igneous rocks are Older Kainozoic basalts referred by Mr. Whitelaw to the Miocene period. They occur in the eastern part of the area mapped at elevations of over 4,000 feet, and form the plateaux of Connor's Plain and of Spring Hill. These rocks do not appear to have been petrologically described before, but Professor Gregory[1] has described an olivine basalt from Mount Matlock within the area covered by Mr. Whitelaw's survey.

No. 974. Connor's Plain. A dark somewhat porphyritic rock of medium grain. Specific gravity=2.76. In section abundant phenocrysts of fresh olivine and of large broad lath-shaped plagioclase are seen. The felspar is a basic labradorite, since symmetrical extinctions of 35 deg. on either side of the twin lamellæ were observed. The background of the rock is of medium texture, and consists of granular pale-brown augite, in places enclosing small lath-shaped plagioclase, but not truly ophitically. In addition, abundant small octahedra of magnetite occur. Limonite occurs lining small cavities and in cracks in the olivine crystals. The rock is a porphyritic olivine basalt.

No. 973. Connor's Plain. A dense, dark, fine-grained rock. Specific gravity=2.83. In section it is noticed that the only phenocrysts are large olivine crystals slightly altered to limonite along cracks. The ground mass is fine-grained and pilotaxitic. It consists of lath-shaped plagioclase, granular, pale-brown augite, and crystals of magnetite. Some fluxion structure is noticeable, and chloritic material occurs in the ground mass. The rock is a fine-grained olivine basalt.

No. 975. Connor's Plain. A dense bluish, fine-grained rock. Specific gravity=2.76. This rock is almost identical in characters with No. 973, and is a fine-grained olivine basalt.

No. 976. Spring Hill. A dense bluish basalt. Specific gravity=2.83. Under the microscope it is seen that phenocrysts of clear olivine are set in a medium-grained ground mass, having a tendency to ophitic texture. The minerals in the ground mass are lath-shaped plagioclase, purplish brown, pleochroic, titaniferous augite and crystals of magnetite. The rock is a titaniferous olivine basalt.

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[1] Howitt. Prog. Rep. II., Geol. Surv., Vict., 1878, pp. 117-147.
[2] Thiele. (a) Vict. Naturalist, vol. XXII., No. 2, 1905, page 22. (b) Vict. Naturalist, vol. XXIV., No. 2, 1907, page 23. (c) Proc. Roy. Soc. Vict., vol. XXI. (new series), 1908, page 240.
[3] Skeats. Pres. add. sect. C, Aust. Assoc., Adv. Science, Brisbane, 1909, pp. 196-199.

[1] Gregory. Appendix to the Wood's Point Gold-field, by O. A. L. Whitelaw. Mem. No. 3, Geol. Surv., Vict., 1905, p. 34.

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3. Notes on the Hope Reefs, Morning Star Dyke, Wood's Point. *Ibid.* 30th Sept., p. 28. 1871.

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| Valleys | 6, 10, 11 |
| Victor's Quartz Mine | 14, 15, 16, 17, 23, 24 |
| Victor's Extended Mine | 24 |
| Volcanic | 7, 9, 10, 13 |
| Vulcan Mine | 16, 24 |
| Walhalla | 14 |
| Walhalla series | 6, 7, 8, 11, 16, 19 |
| Walhalla beds | 8, 9, 12, 16 |
| Waverley Mine and Dyke | 13, 14, 20 |
| Wedge-shaped valleys | 5 |
| Wellington River | 9 |
| Western basal-grit | 12 |
| Western Reef | 21 |
| Yarra Track | 8 |


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Fig. 1.—Highly Cleaved Upper Ordovician Black Slate: Main Divide between Spring Hill and Mt. Selma. Graptolites are plentiful where Bedding and Cleavage Coincide. Looking South-east.



Fig. 2.—Green Schists (Lower Silurian or Upper Ordovician) showing Nearly Vertical Cleavage and Horizontal Bedding, East of Mt. Selma.

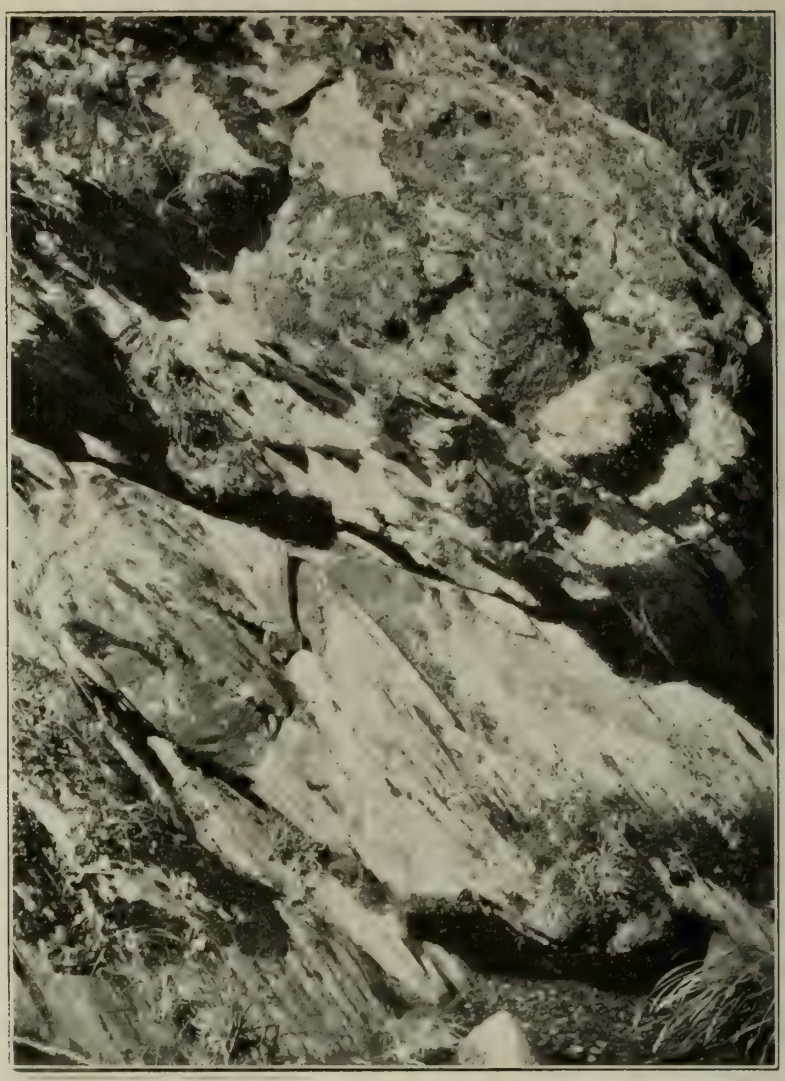



FIG. 1.—JUNCTION OF THE LOWER SILURIAN (MT. USEFUL BEDS C—C) AND UPPER SILURIAN (JORDAN RIVER BEDS OR SERPENTINE CREEK SANDSTONES A A), SERPENTINE CREEK. B B INDICATES A FAULT-LINE OR UNCONFORMITY.

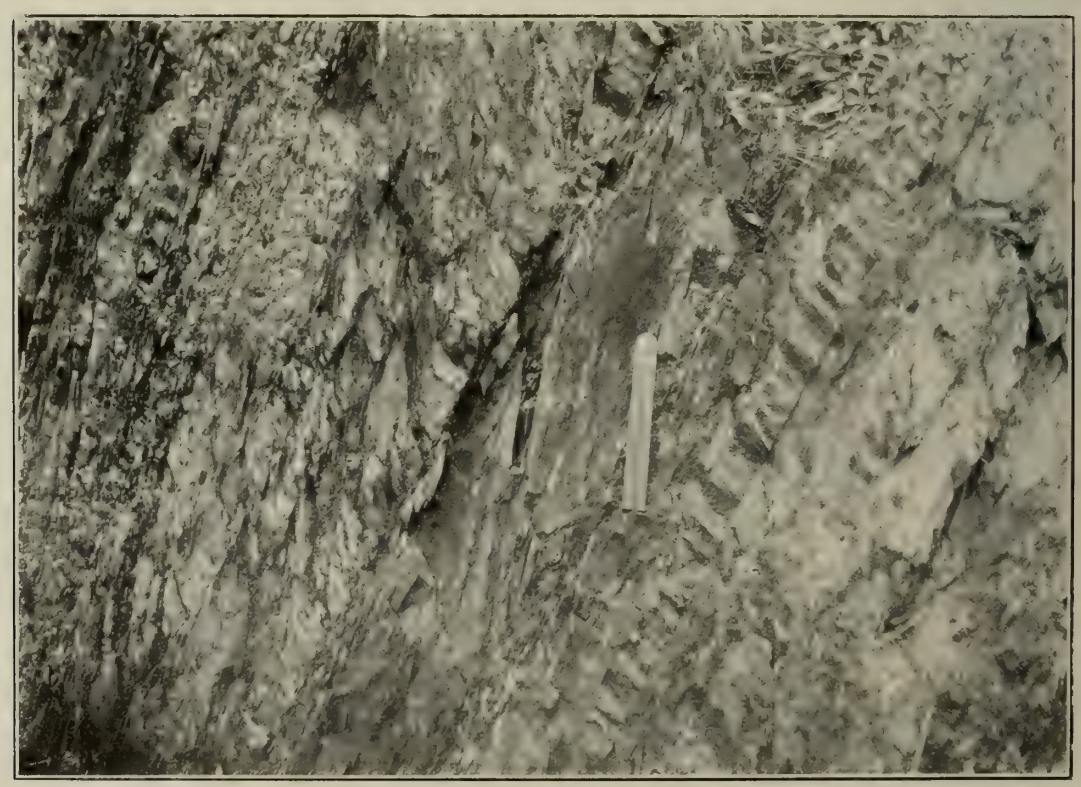


FIG. 2.—BEDS EAST OF THE STRAP AND BUCKLE REEF, ROYAL STANDARD MINE; THIN BEDS OF SANDSTONE AND HIGHLY CLEAVED SLATES. LOOKING SOUTH-EAST.

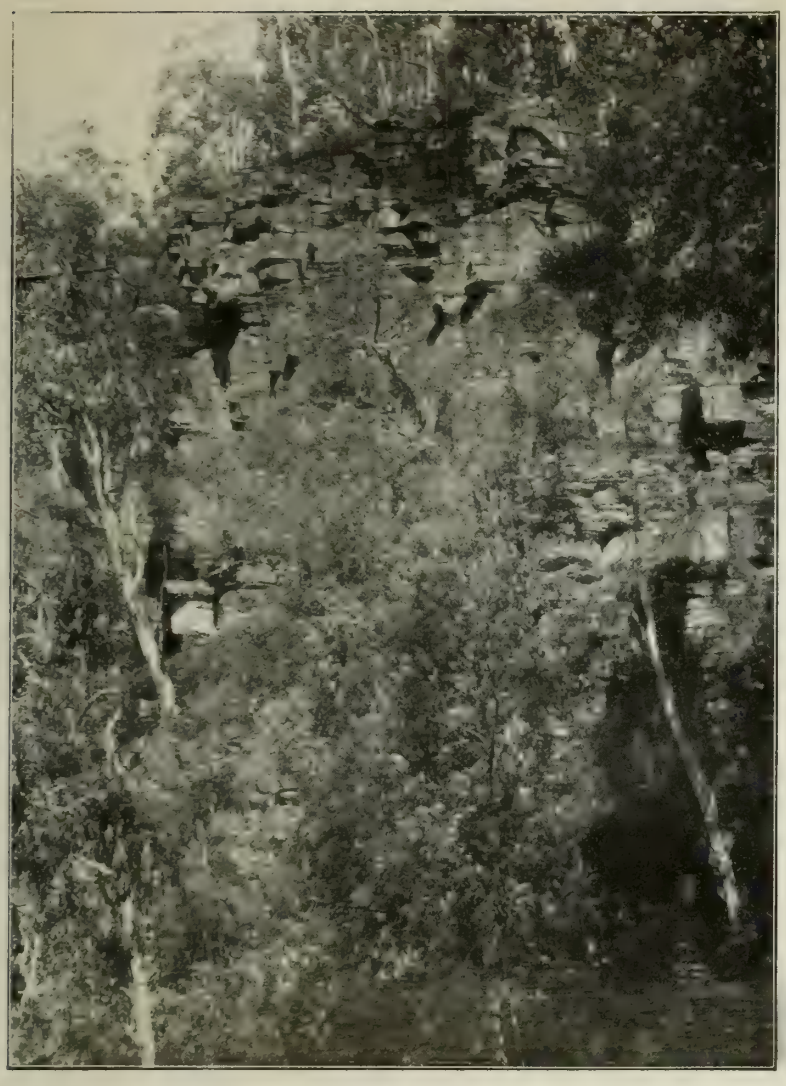


Fig. 1.—The Bluff, East of Connor's Plain, showing the Horizontally-bedded Serpentine Creek Sandstones (Upper Silurian—Jordan River Series) on top of an Anticline.



Fig. 2.—Anticlinal Fold in the Serpentine Creek Sandstones; the same Fold is shown in Pl. V., Fig. 1, but 9 miles further to the South. Serpentine Creek.

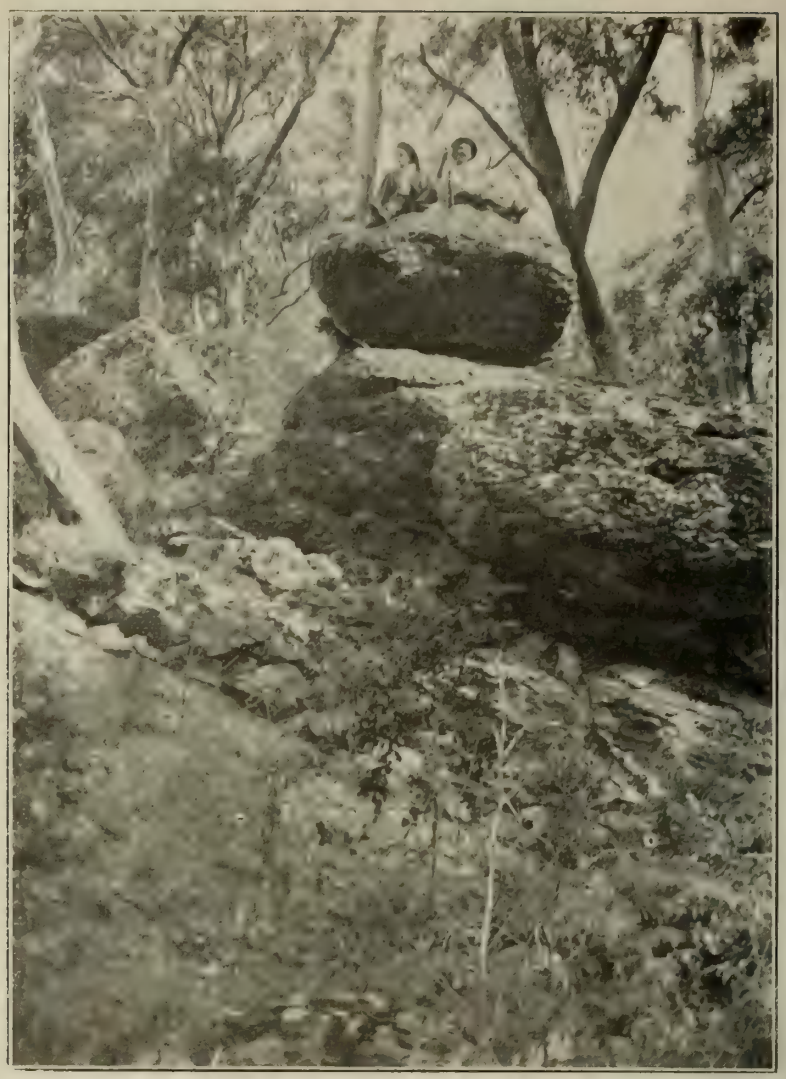


FIG. 1.—DEVONIAN PORPHYRY: TOLL GATE, FULLARTON'S SPUR, BETWEEN THE MAIN DIVIDE AND THE BARKLY RIVER.



FIG. 2.—CLIFFS OF COARSE DEVONIAN SANDSTONE OVERLYING THE BASAL CONGLOMERATE, MT. SKENE BRANCH OF THE BARKLY RIVER, THREE-QUARTERS OF A MILE ABOVE ITS JUNCTION WITH THE MT. CLEAR BRANCH.




Fig. 1.—View North of West from the Bull Run Spur near Glencairn Creek. Upper Devonian Rock as far as the Mt. Skene Branch of the Barkly River; Silurian Rocks with a Narrow Belt of Upper Ordovician near the Snow-line on the High Range beyond.



Fig. 2.—The Macalister River in the Late Summer. A Typical Valley in Devonian Strata.

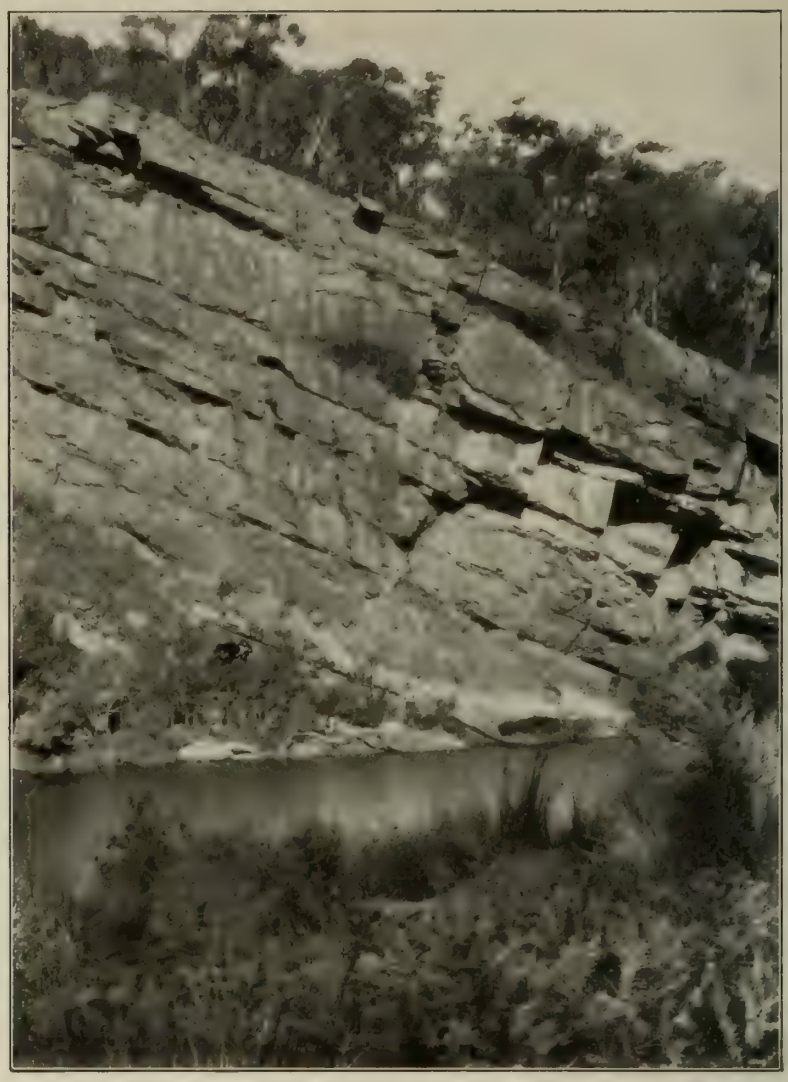


FIG. 1.—UPPER DEVONIAN SANDSTONES DIPPING SOUTH-EAST: KENDAL'S FLAT, MACALISTER RIVER.



FIG. 2.—"SALT-LICK" IN SOIL AND CLAY OVERLYING DEVONIAN ROCKS, GLENCAIRN CREEK.



Fig. 1.—Cemented Wash (Miocene), North-east End of Spring Hill Plain.



Fig. 2.—Connor's Plain, a Basaltic Plateau (4,340 feet above sea level), with Mt. Selma in the Distance.



FIG. 1.—TYPICAL TERRACE DEPOSITS, MCLEAN'S FLAT, GOULBURN RIVER.



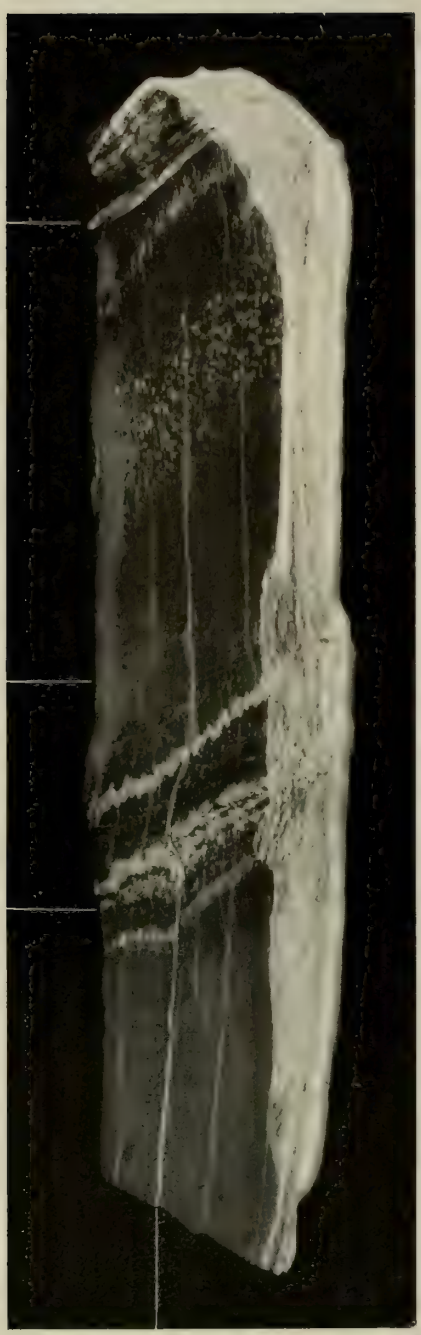
FIG. 2.—BENNETT'S HYDRAULIC SLUICE CLAIM, JORDAN RIVER; THE ALLUVIAL IN THIS FLAT HAS YIELDED NUGGETS UP TO 80 OZ. IN WEIGHT.

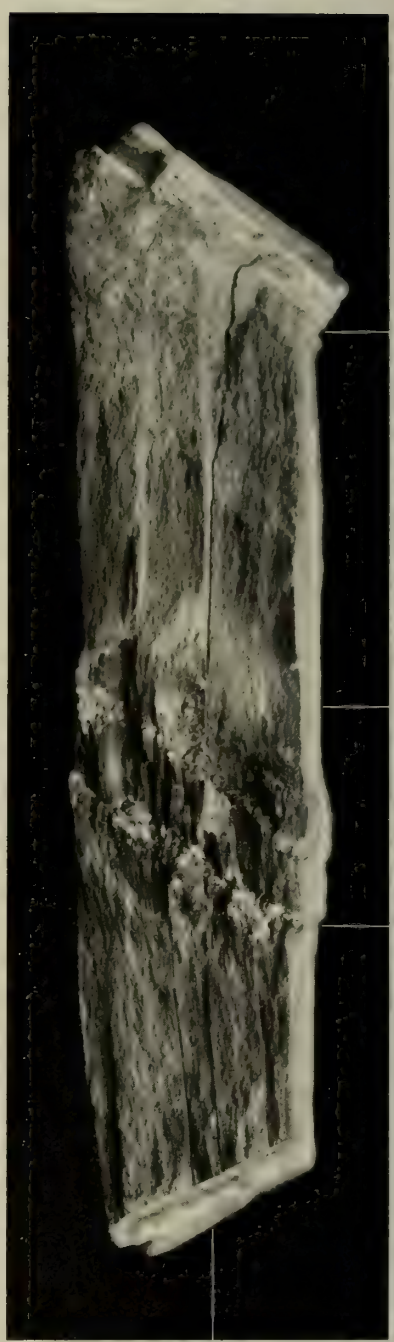



Fig. 1.—View looking North from Bald Hill Spur: illustrates the Present Course of the Macalister River and its Former Course through Glencairn Valley.



Fig. 2.—Glencairn Valley with the Crinoline in the Distance.




HIGHLY CLEAVED SLATE WITH QUARTZ AND PYRITES DEPOSITED PARALLEL TO THE BEDDING PLANES, ROYAL STANDARD MINE.



FIG. 1.—SCENERY IN THE DEVONIAN AREA: STEEP SLOPE (3,000 FT.) FROM THE MACALISTER RIVER TO THE RANGES SURROUNDING THE CRINOLINE.



FIG. 2.—OPEN CUT, ROYAL STANDARD MINE. LOOKING NORTH.

FIG. 1.—OPEN CUT, ROYAL STANDARD MINE. LOOKING SOUTH.



FIG. 2.—ANTICLINE EAST OF THE ROYAL STANDARD SYNCLINE, NORTH OF THE OPEN CUT IN FIG. 1.




# HARBINGER MINE

## DRY CREEK.

## JERICHO.

Scale – 100 Feet to 1 Inch.

## Plan of underground workings.

NOTE – THIS MINE YIELDED 8171 OZ. OF GOLD FROM 12,583 TONS OF STONE




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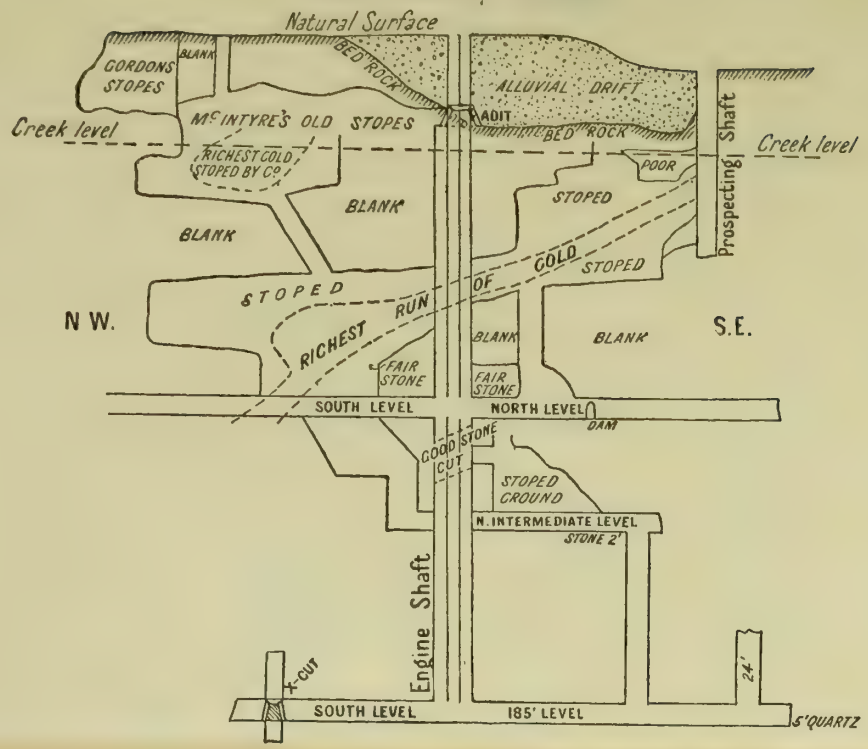
SECTIONS OF

# Mc INTYRE'S QUARTZ MINE,

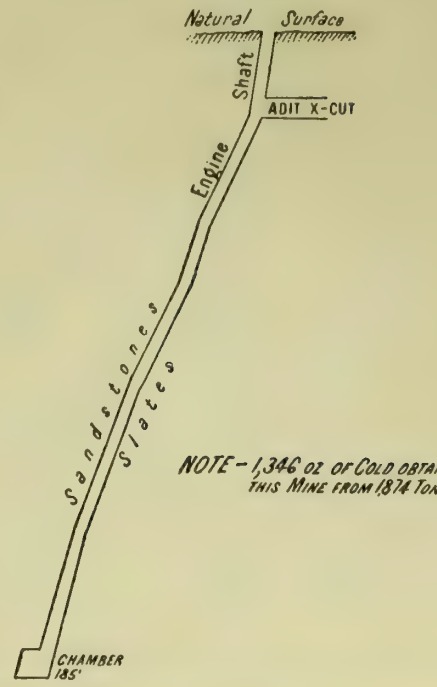
## ROSS'S CREEK—WOODS POINT.

Scale—60 Feet to 1 Inch.

### LONGITUDINAL SECTION




### TRANSVERSE SECTION



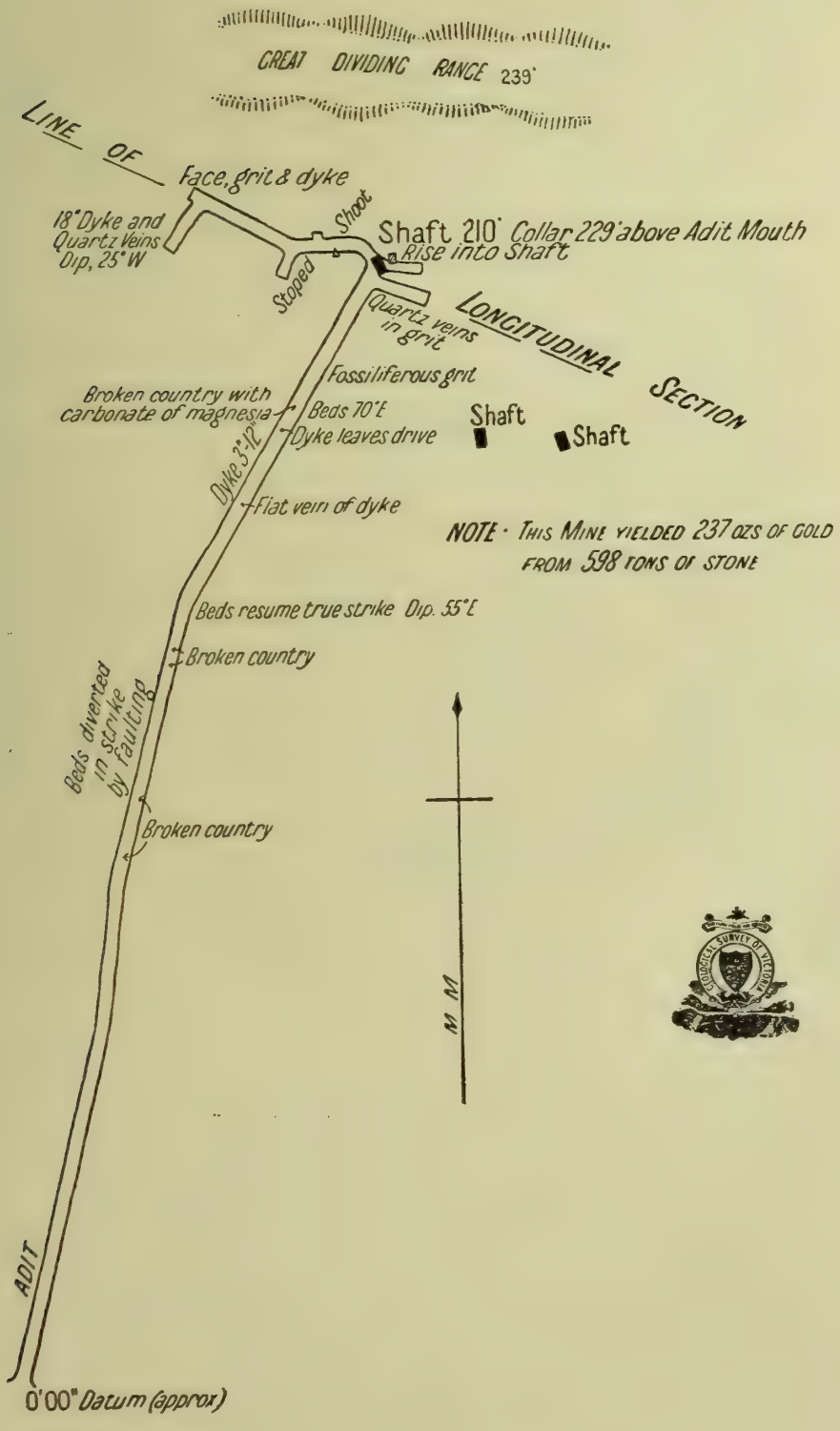

NOTE—1,346 oz of Cold obtained from this Mine from 1874 Tons

# GARIBALDI MINE,

## MATLOCK.

### PLAN OF UNDERGROUND WORKINGS.

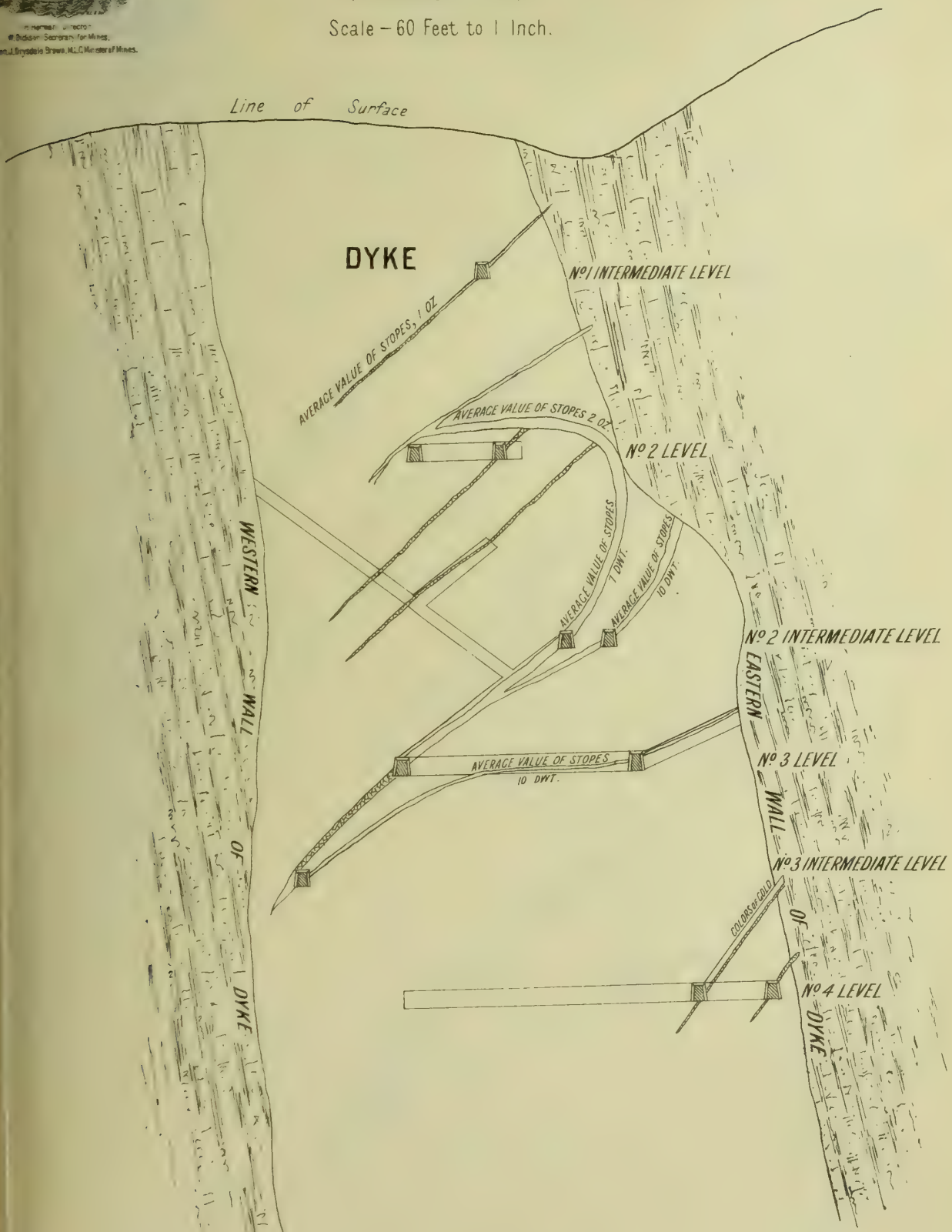
*Scale—100 feet to 1 inch.*



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# SECTION A
# ACROSS NEW LOCH FYNE DYKE
## MATLOCK.
(Looking East)

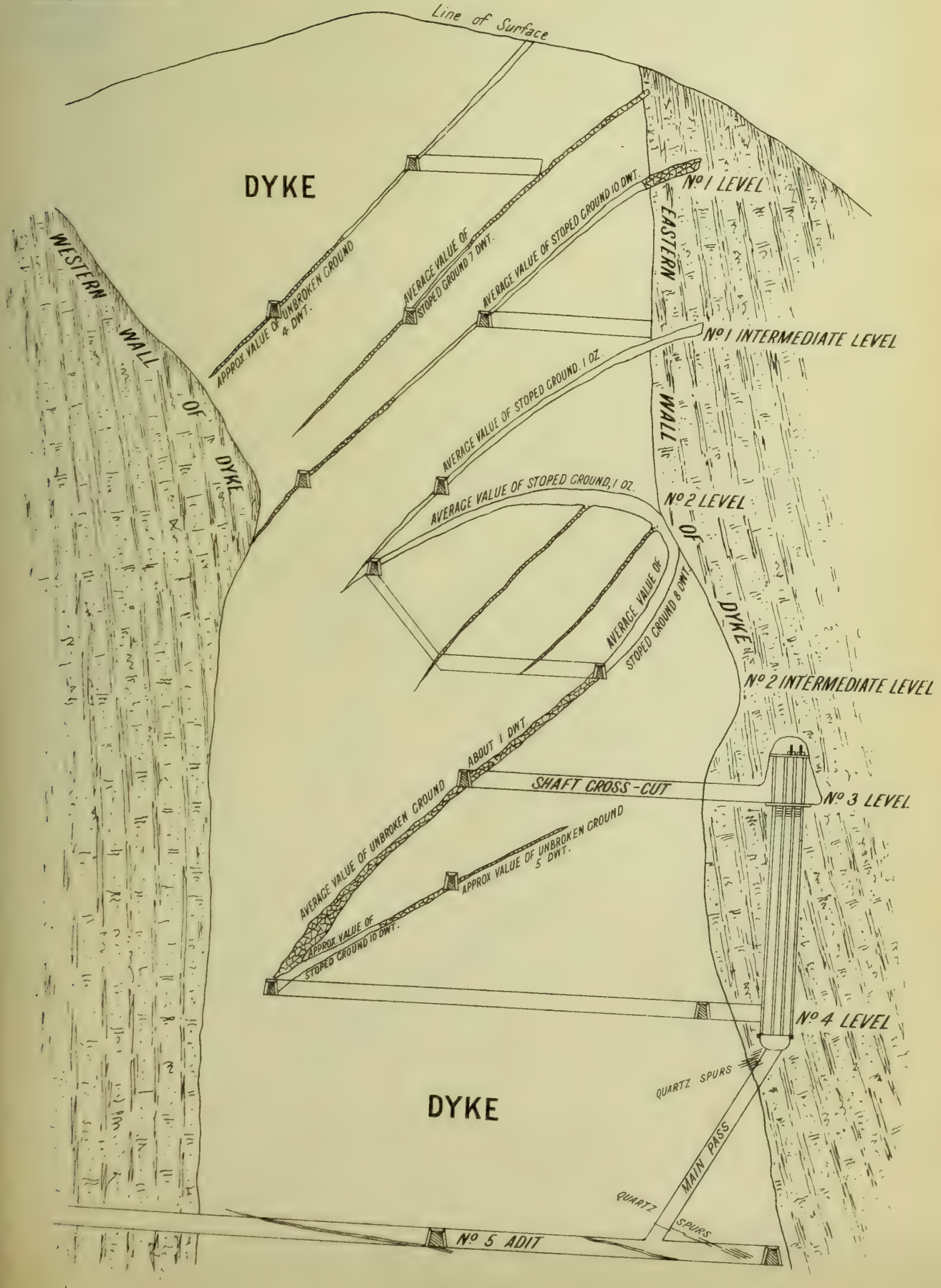
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# SECTION B.
# ACROSS NEW LOCH FYNE DYKE, MATLOCK.
## (Looking East)

Scale – 60 Feet to 1 Inch.



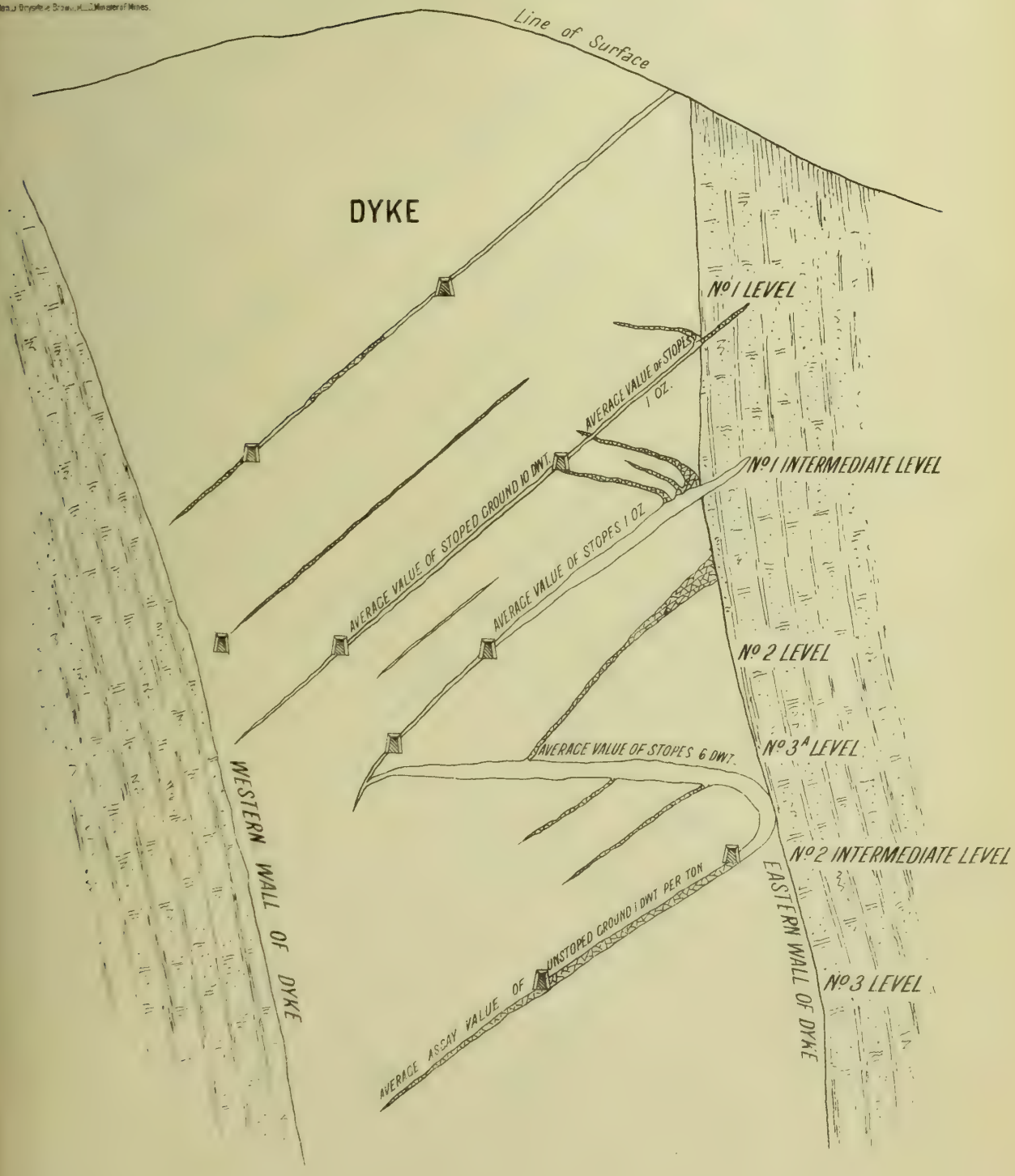
# SECTION C.

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(Looking East)

Scale – 60 Feet to 1 Inch.

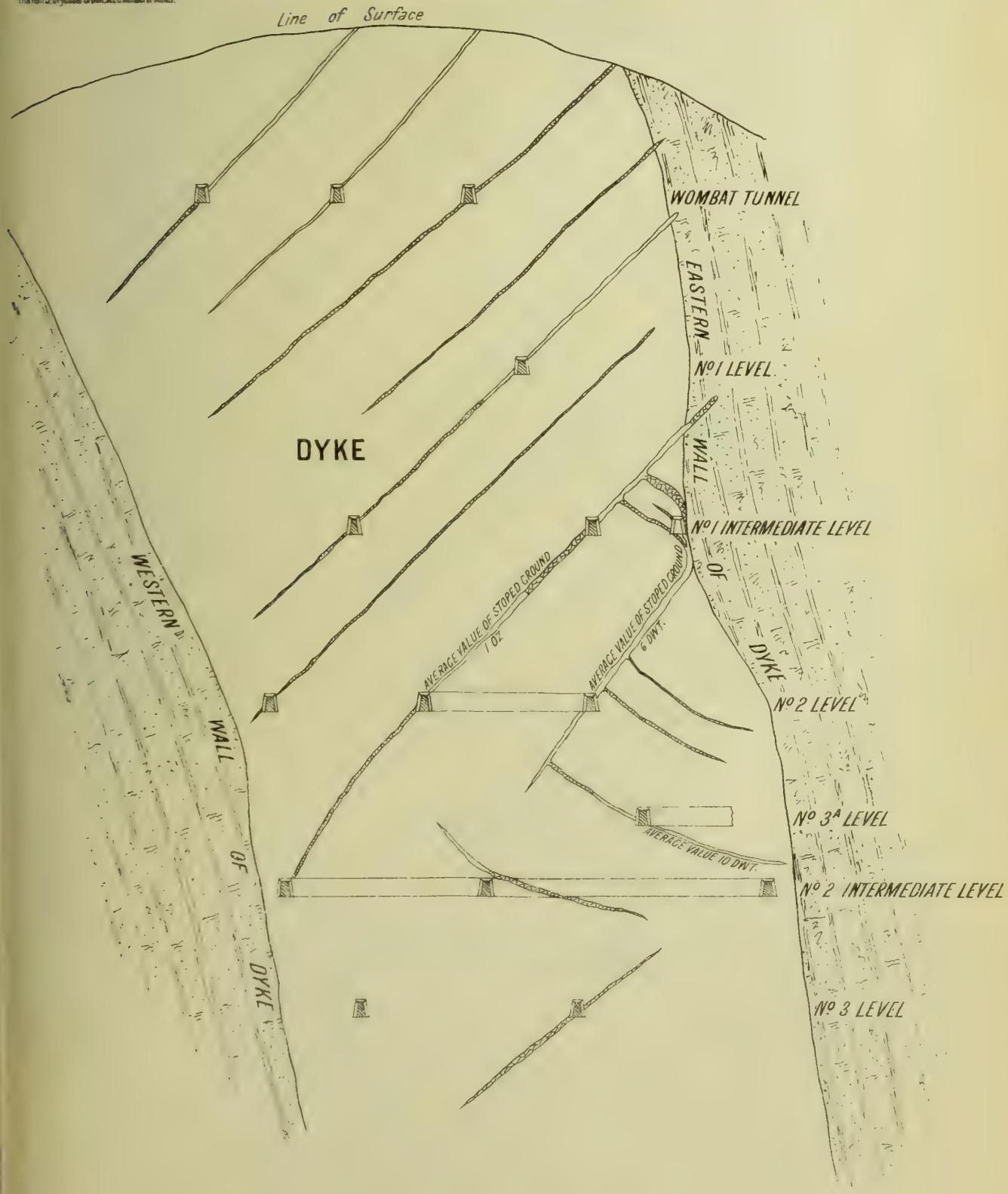
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# SECTION D.
# ACROSS NEW LOCH FYNE DYKE, MATLOCK.
## (Looking East)

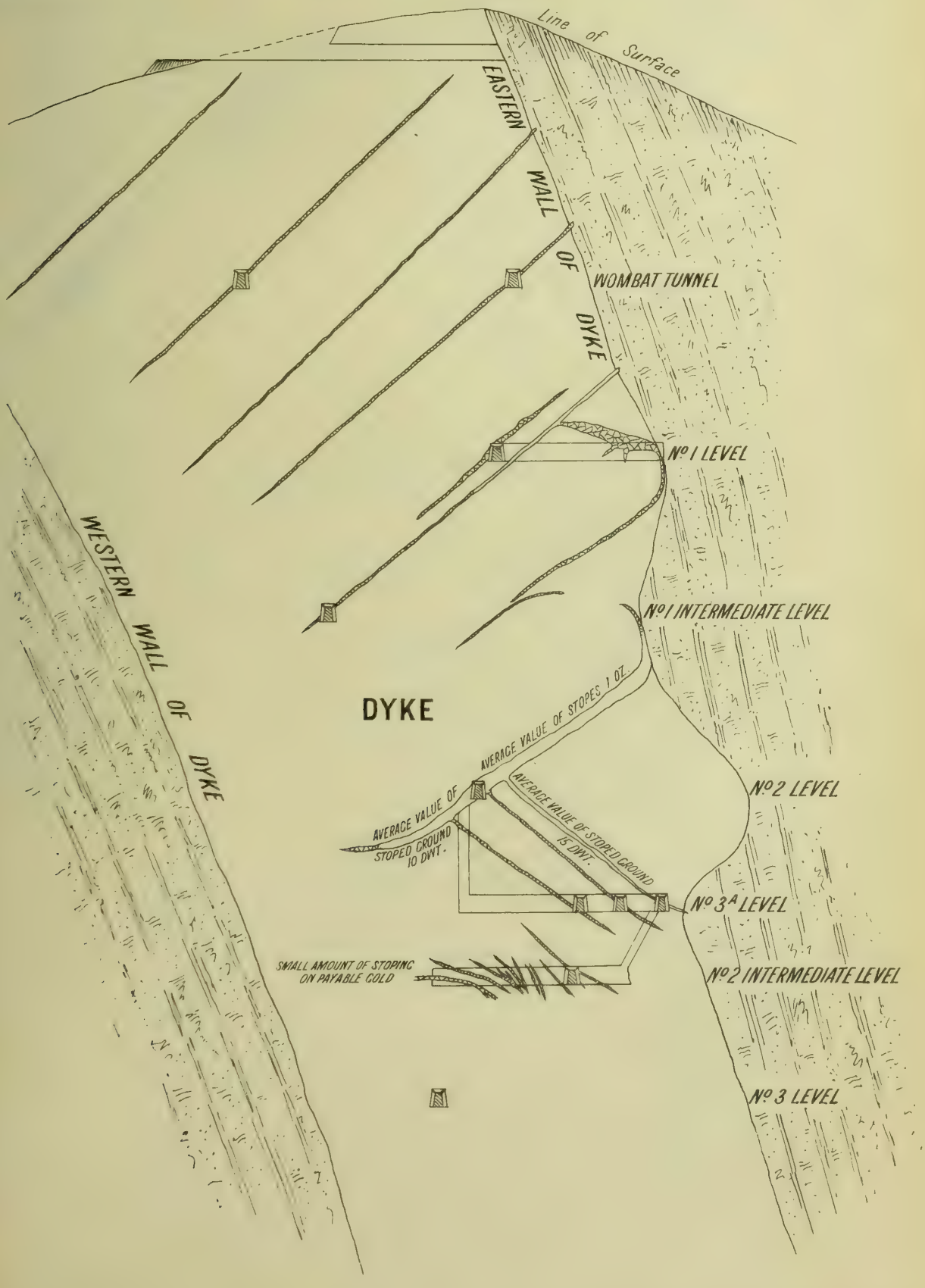
Scale – 60 Feet to 1 Inch.



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# SECTION E.
# ACROSS NEW LOCH FYNE DYKE, MATLOCK.
## (Looking East)

Scale – 60 Feet to 1 Inch.



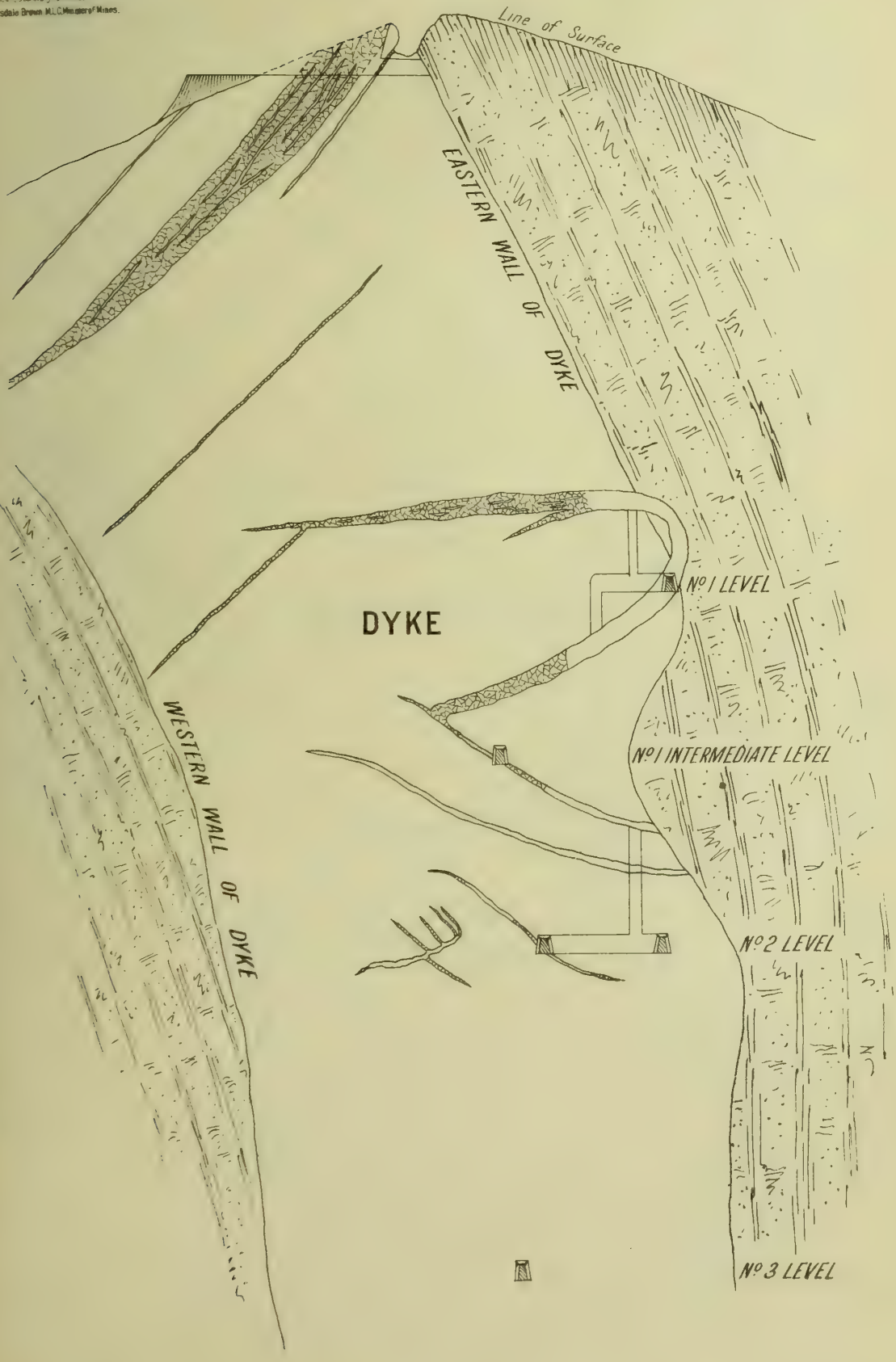
SECTION F.

# ACROSS NEW LOCH FYNE DYKE, MATLOCK.

(Looking East)

Scale – 60 Feet to 1 Inch

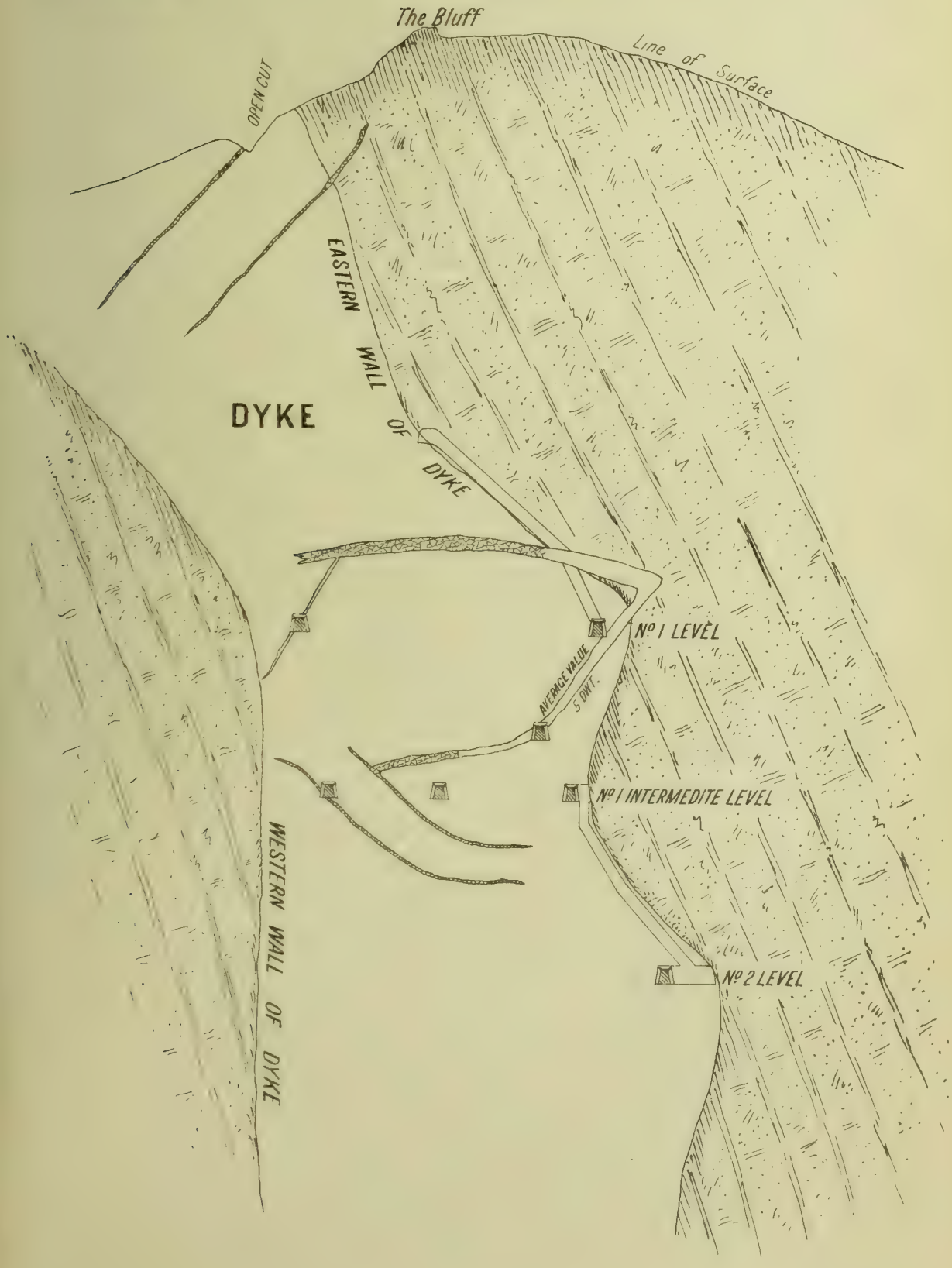
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# SECTION G.
# ACROSS NEW LOCH FYNE DYKE, MATLOCK.
(Looking East)

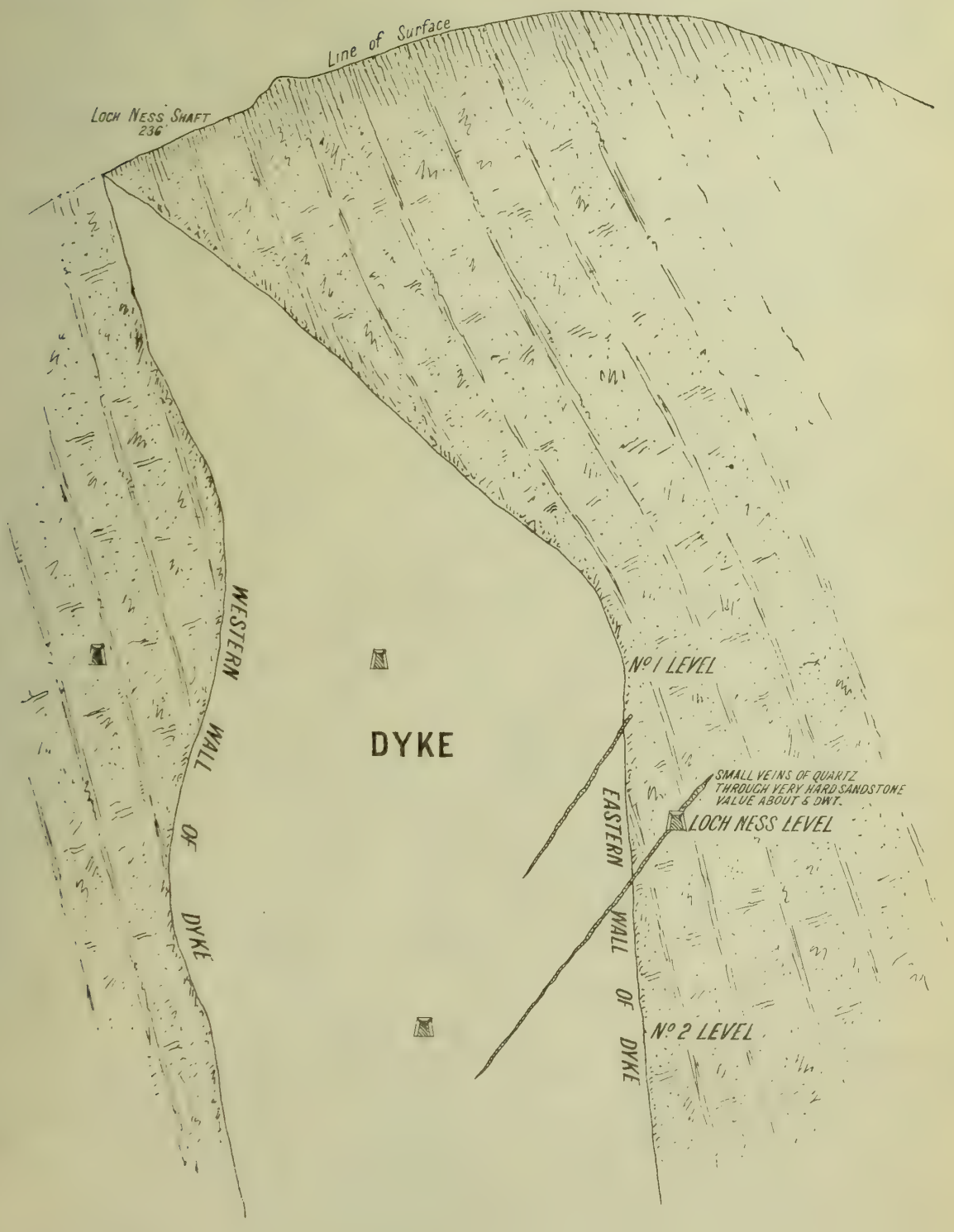
Scale – 60 Feet to 1 Inch.



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# SECTION H
# ACROSS NEW LOCH FYNE DYKE
# MATLOCK.
## (Looking East)

Scale—60 Feet to 1 Inch.



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## WITH PLATES AND FIGURES,

BY

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DIRECTOR, GEOLOGICAL SURVEY.

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# PREFATORY NOTE.

The survey of the Ballarat gold-field was begun in 1906, when mining was still active, and the work was greatly appreciated and availed of by the various managers. The work was necessarily slow, since it embraced the detail survey of all accessible workings, and as mines were closing the work was carried out in such a manner as to secure all data before the levels became flooded. The office work, involving the plotting of the various plans, was delayed until a draftsman was available. This and the surface work were completed as opportunity permitted.

Increasing costs, difficulties coincident with greater depths, flooding of abandoned mines and, finally, the outbreak of the war has, for the present, closed all the mines at Ballarat.

The field may revive again, and the details contained in the following pages should be of considerable value to future companies as a guide to the underground workings and as a record of the geological conditions and rock structures that were associated with successful mines in the past.

From the area embraced within the survey gold to the value of about £50,000,000 was obtained, and as no previous publication has dealt fully with the field from the inception of mining, the report should be of historic interest, since Ballarat ranks among the foremost of the gold-fields of the world.

The main features of the Ballarat field are—first, that the auriferous quartz is associated with certain favourable zones of beds ; and, secondly, that payable quartz in the Ballarat East zone is found only in those beds of the favourable zone that dip east, and in the Ballarat West zone only in those beds that dip west. The Ballarat East and Ballarat West zones have not been correlated, nor has any clue been found to indicate the reason for the association between the dip of the beds and the gold context of the quartz reefs that traverse them.

To the various mine managers at the respective mines and to the members of the staff, who loyally co-operated in the work, I desire to express my appreciation.

W. BARAGWANATH.

# THE BALLARAT GOLD-FIELD.

## INTRODUCTORY.

The area dealt with in this report comprises the main central portion of the Ballarat gold-field, and embraces a strip of country 5¼ miles long by 2¾ miles wide. Within this small space are the principal alluvial and quartz mines, and the now depleted shallow diggings that were once almost fabulously rich.

A central line divides the surveyed block into two geologically dissimilar parts, that on the east consisting of exposed schistose sedimentary rocks, while the western portion is part of an extensive basalt plain. In the eastern portion numerous small gullies draining into one main stream were the site of the early shallow diggings; in the western part the basalt covers the rich deep leads mined at a later date. The lodes and quartz spurs of the Ballarat East belt, like the shallow alluvial, were early worked, while the Ballarat West lodes, which are distinct in type, were found during the deep alluvial operations or subsequently.

The Ballarat gold-field may, for purposes of description, conveniently be divided into three distinct parts—(*a*) Ballarat West or Sebastopol; (*b*) Ballarat East; and (*c*) Little Bendigo. The present survey deals only with the first two. These three parts, which are fully described hereafter under Geology (pp. 49-56) and Lode-mining, form approximately parallel belts, but differ entirely in structure.

## TOPOGRAPHY.

The Ballarat gold-field is situated in Lat. 37 deg. 34 min. south, Long. 143 deg. 52 min. east, and is distant 74 miles in a westerly direction from Melbourne by rail. The altitude above sea level of the area surveyed in detail ranges from 1,250 feet on the southern boundary to 1,690 feet on the northern boundary; the height of the Ballarat Railway Station, 1,416 feet, being adopted as datum.

The gold-fields occupies the western flank of a meridional range which extends south from Spring Hill, passing eastwards of Ballarat and extending to the western side of Mt. Buninyong. This meridional range, which forms a conspicuous feature in the past, as well as the present, topography, is composed of slates and sandstones of Ordovician age, much folded, contorted, and intruded by numerous dykes. Eastward from Ballarat and extending in a south-easterly direction, the Ordovician rocks have been metamorphosed by the granitic intrusion which is exposed near the Gong-Gong Reservoir, and southerly at intervals to Lal Lal. Along the range are isolated remnants of an early gravel of the peneplain period. The range varies in altitude from 1,800 feet to 2,200 feet above sea level.

Eastwards and westwards from this range the former streams, now part hidden by lava flows, took their course. The lava flows have considerably affected the general configuration of the country, and have largely determined the course of the present streams. Eastwards from the above-mentioned range a basaltic area, known as the eastern plateau, extends for a distance of 10 miles to another meridional ridge, which passes near Gordons Railway Station. The source of this basalt lies in a series of comparatively low hills extending north-easterly from a point 6 miles north-east of the Ballarat Post Office for 5 miles towards Mollonghip, and having an altitude of from 2,200 feet to 2,500 feet above sea level. These volcanic hills form part of the main divide, or watershed, separating the north from the south flowing streams.

The surface of the eastern plateau basalt flow has a general southerly and easterly fall. Scattered over the area are several scoria cones, the largest being Mt. Warrenheip, 2,463 feet above sea level, from which small lava flows have extended. These isolated cones have not emitted large volumes of lava, and in every instance they appear to be later than the main lava flows of the plateau. The railway to Melbourne rises from Ballarat to the level of the plateau near Warrenheip Railway Station, and traverses this area for several miles at an altitude ranging from 1,750 feet to 1,950 feet above sea level.

The structure of the rock buried beneath the eastern plateau can only be conjectured, but to judge from the evidence derived from a few bore holes and numerous wells, the basaltic cover is comparatively thin, and rests on an area formed largely of decomposed granite. Auriferous leads from the Ballarat area pass under the western edge of the basalt; but their courses, which lie under the Ballarat water reserves, have not been determined.

Westward from the meridional range the surface features present more diversity. Broadly, this portion can be divided into a gently undulating basalt plain, and an area of Ordovician strata, the surface of which in general falls westerly. The Yarrowee Creek, southwards from near the junction of Gnarr Creek, forms a marginal stream on the western edge of the basalt area. The basalt extends northerly beyond the junction of Yarrowee and Gnarr Creeks, and crosses the main divide 6 miles north of Ballarat, where its eastern edge is 1,500 feet above sea level. The eastern edge of the basalt is parallel to the meridional range referred to above, and distant about 4 miles from it. Westerly and north-westerly the basalt extends for many miles, pierced by occasional inliers of granite and Ordovician strata, as at Mt. Bolton, Stony Rises, and Pound Hill. Though the surface of this extensive area is almost flat, the basalt has welled up from many points of eruption, which now form slight prominences. Northwards, a line of scoria cones, the bases of which have coalesced on the pre-existing lava flow, now form portion of the watershed between streams flowing north towards the Murray and those flowing westerly into Lake Burrumbeet, and eventually to the south. Much of the area in the vicinity of the main divide consists of flat land, swampy in places, and having no pronounced fall. The watershed in part connects with the granite outcrops, but such a connexion is only accidental; the granite areas have not determined the position of the main watershed, for similar granite areas both north and south of the main divide attain to higher altitudes.

The eastern plateau is 400 feet to 500 feet higher than the western or Ballarat plateau, a striking difference in level. The extreme altitude of the Ballarat plateau, excluding the scoria cones, is just over 1,500 feet above sea level. Even including the various scoria cones on both plateaux, the difference of altitude is the same. From the evidence afforded in the various mines, it is very unlikely that faulting on a large scale took place subsequent to the extrusion of the basalt, but there appears to be little doubt that the eastern edge of the Ballarat plateau conforms to the strike of an older meridional fault line.

Parallel to the main meridional range east of Ballarat the remnants of a main range can be traced northwards from Staffordshire Reef, 16 miles south-west of Ballarat, through Smythesdale, and passing to the south-east of Lake Burrumbeet, where it disappears beneath the basalt. From the southern end of this range a connecting spur, now dissected, can be traced through Hardhills, thence north-easterly towards Mt. Buninyong. This range forms the southern watershed of the north-flowing stream passing through Napoleons, and forming portion of the deep lead system.

Westerly from Smythesdale a spur forms the southern watershed of Snake Valley (Carngham) and its branches, the drainage of which is northerly for some distance until it reaches the basalt, where it turns abruptly to the south.

The present valley of Smythe's Creek heads from the basalt some 6 miles north of the former divide, through which the stream has now cut its way.

Reviewing the whole area westwards of Ballarat, it is apparent that the present drainage system does not conform to the original configuration of the bed rock. The Yarrowee Creek has its course at right angles to many of the deep leads (*see* Fig. 4), while to the south a V-shaped lead in a narrow gorge lies parallel to it[1]. Dead Horse and tributary gullies (Fig. 3.) flow northwards from Ballarat over portion of the basalt area along the junction of the flows, or as a marginal stream to the north of Pound Hill and into Lake Burrumbeet 1,270 feet above sea level. Lake Burrumbeet also receives streams from the north, south, and west, and itself overflows in a southerly direction.

[1] See plan of Durham Lead, Prog. Rept. Geol. Surv., Vict., No. VI., p. 51

# PHYSIOGRAPHY.

After the Ordovician bedrock of the field had been folded into synclines and anticlines came a long period of denudation. What changes of elevation were undergone by the surface cannot be conjectured. Within a radius of 15 miles of Ballarat there is no formation exposed, except the intrusive granites, referable to the period between the Ordovician and the Tertiary. Beyond this radius, glacial deposits of Permo-Carboniferous age occur, but if similar formations ever existed in the Ballarat district, all remnants of them have been removed with the exception of a supposed Permo-Carboniferous formation which has been recorded in the Midas alluvial mines 7 miles northward, though the evidence of its age has not been published. A number of outcrops of glacial deposits occur to the north and east of Gordons on a line passing through the Midas deposit and connecting Greendale and Bacchus Marsh.

The physiographic history of the district can only be traced from the present contour of the surface and the distribution of the Tertiary alluvial deposits. The earliest feature of which any trace is left was a peneplain, the surface of which was apparently subjected to extensive faulting during the earlier stages of the formation of the alluvial deposits. Remnants of this peneplain extend

During the earliest stages of the history of the peneplain there was a general subsidence of the area now occupied by the Sebastopol Plateau and Ballarat West, probably aided by faulting along a line parallel to Yarrowee Creek, with the result that the general surface level of that area was at least 500 feet lower than the peneplain to the east. The southern limit of the more extensive subsidence was probably along the northern portion of the Bonshaw estate, but another area of subsidence along the same line of probable faulting extended southwards beyond Napoleons. After the subsidence, denuding agencies worked on this area while the peneplain to the east was probably unaffected beyond a limit of 3 miles. The agencies affecting the changes in the sunken area were probably lacustrine (marine according to Murray), while streams were cutting their valleys into the bounding escarpment and depositing on the lower slopes reef-washes which consist of well-rounded boulders of the hardest rocks.

After a time the surface of the lake was lowered either by the lowering of the outlet or by the elevation of the shore line, and the streams then cut their way through the reef-washes to a depth of over 200 feet in the western portions of the field. Examples can be seen at the Park, the Band and Albion, &c. This deepening of the

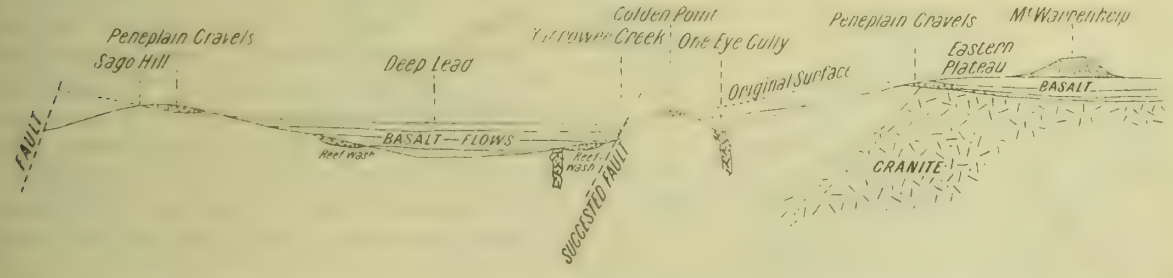



Fig. 1. Sketch section across the Ballarat Gold-field, showing suggested Faulting. Looking north. Not to scale.

eastwards from a north and south line which runs from a point 1 mile east of Mt. Helen railway station (near Buninyong) along the Monte Christo and Grey Horse Range at Little Bendigo to the Main Divide at the head of Dead Horse Gully and its branches. To the east of this line, well matured valleys and a portion of the peneplain with scattered remnants of the earliest or high-level hill-gravels still exist, but to the west the matured valleys are now buried and form the deep leads. Midway between Mt. Helen and the Main Divide what appears to be a warping of the surface has caused denudation to have the most marked results in this vicinity, and here the Eureka, Gravel Pits, Caledonia, and Lady Barkly leads are situated; this line is along the strike of several cross-courses which appear to have been formed by the intrusion of the granite near Warrenheip.

main channel of the lead system probably caused considerable changes in the eastern portion of the field. A striking example of river capture is furnished by the up-stream portion of the Miner's Right lead. This now occupies a saddle in the White Horse Range on the course of a large gully falling into One Eye Gully and heading from the peneplain; the old lead in this saddle is 50 feet above the surface of One Eye Gully and 140 feet above the lead there, but a point worthy of note is that there is no indication of high-level gravels along One Eye Gully from this position southwards (*see* Murray's plan of the Ballarat gold-field), although these gravels are extensively developed a little to the north. While it is difficult to explain the causes of such a capture, the large Prince Regent cross-course to the north may have had something to do with it, and the deep channels of the Warrenheip, Canadian, and other leads to the north may also have assisted.

The lead trending southwards from Sebastopol was one of the latest to be formed in the Ballarat district. The channel is V-shaped and appears to this vicinity between Ross's Creek and the Bonshaw or Winter's Creek. The wash in this locality is about 980 feet above sea-level.

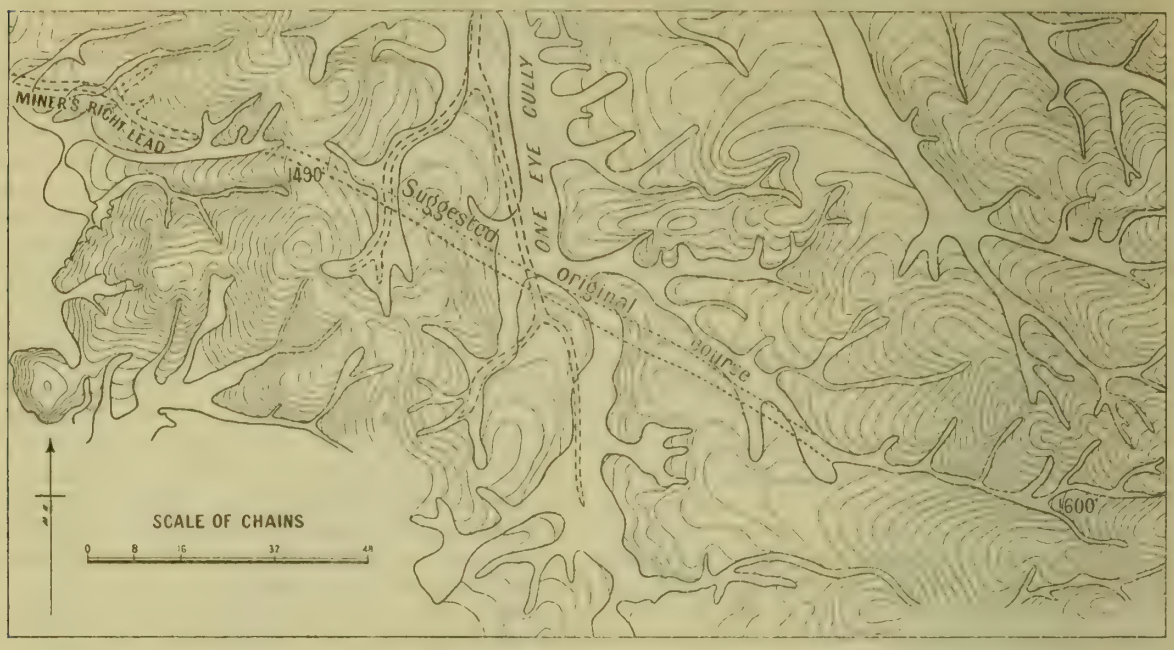



Fig. 2. Probable course of Miner's Right Lead prior to capture by One Eye Gully.

have been continuous from the Frenchman's lead, near the southern end of the mapped area, to the Leviathan mine at Cambrian Hill, about 3 miles south of the mapped area. From that point south-east to the Franklin mine, an interval of nearly half-a-mile, it has not been proved, and the history of the Franklin company would indicate

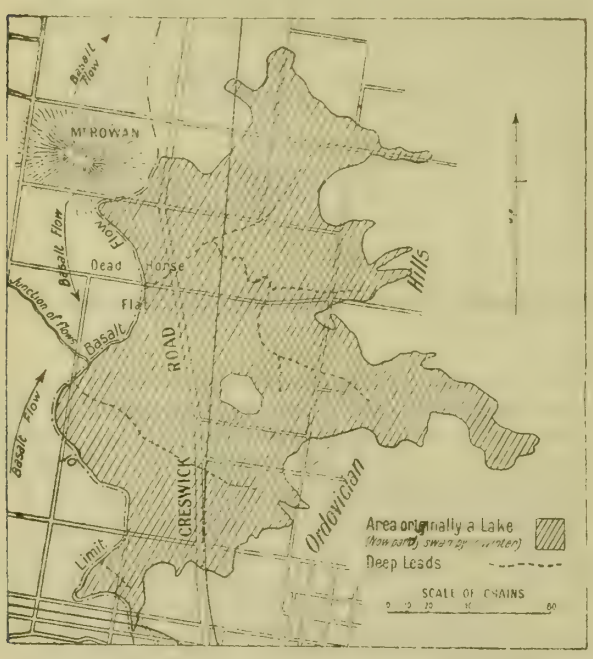



Fig. 3. Outline of Lake formed by the Basalt Flows of Mount Rowan and Ballarat West blocki g the streams at Dead Horse Flat. (This area has not been dissected.)

that the lead worked by it headed within the Franklin claim. The levels of the Leviathan company's workings indicate a widespread field of wash, and in the Great Gulf company's workings to the north the extent of the wash was never proved. There is probably a subsided area in

The formation of deep-lead channels was brought to a close by the volcanic period which gave rise to the basalt flows. The lava flows dammed back the streams and formed a series of lakes and marginal streams. In the lakes or dams siltation and deposition took place. A large basin or lake of this type on the Creswick-road from 2 to 5 miles north of Ballarat (Fig. 3) shows in a marked manner its origin, the hill slopes of Ordovician rocks abruptly ending on the north and east at a wide flat which is swampy in winter and which is bounded on the west by a basalt plain. Bores and shafts in this flat have proved layers of typical lacustrine clay, silt, and sand. A number of other lakes were formed in the same way along the Yarrowee (*see* A, B, C, D, E, F, G, Fig. 4).

At Ballarat East the outlet of a dam or lake of considerable extent was located near Bradshaw-street, about where the Nightingale lead crosses the Yarrowee (*see* A, Fig. 4). The upper limits of this lake correspond with the 1,405-ft. contour. It would extend about 3 miles northwards up the present Yarrowee Creek to near the Victoria United battery at Black Hill Flat; eastwards an arm would run up the Eureka lead above the Caledonia bridge and encircle the foot of Mt Xavier; and southwards a branch over 3 miles long with a maximum width of 2½ miles ran east of the White Horse Range along Canadian lead and White Horse Gully as far as the Half-way House on the Buninyong-road. The partial infilling of the lake along the margin, as well as in the deeper portion, altered the whole configuration of the flatter or deeper portion. The Yarrowee Creek formed as a marginal stream along the

northern and western edge of the flat. The stream in One Eye Gully adhered more closely to the course of the Canadian lead, but its lower end fringe of the upper basalt flow, the eastern edge of which extended on the average about a quarter of a mile beyond the present limit.

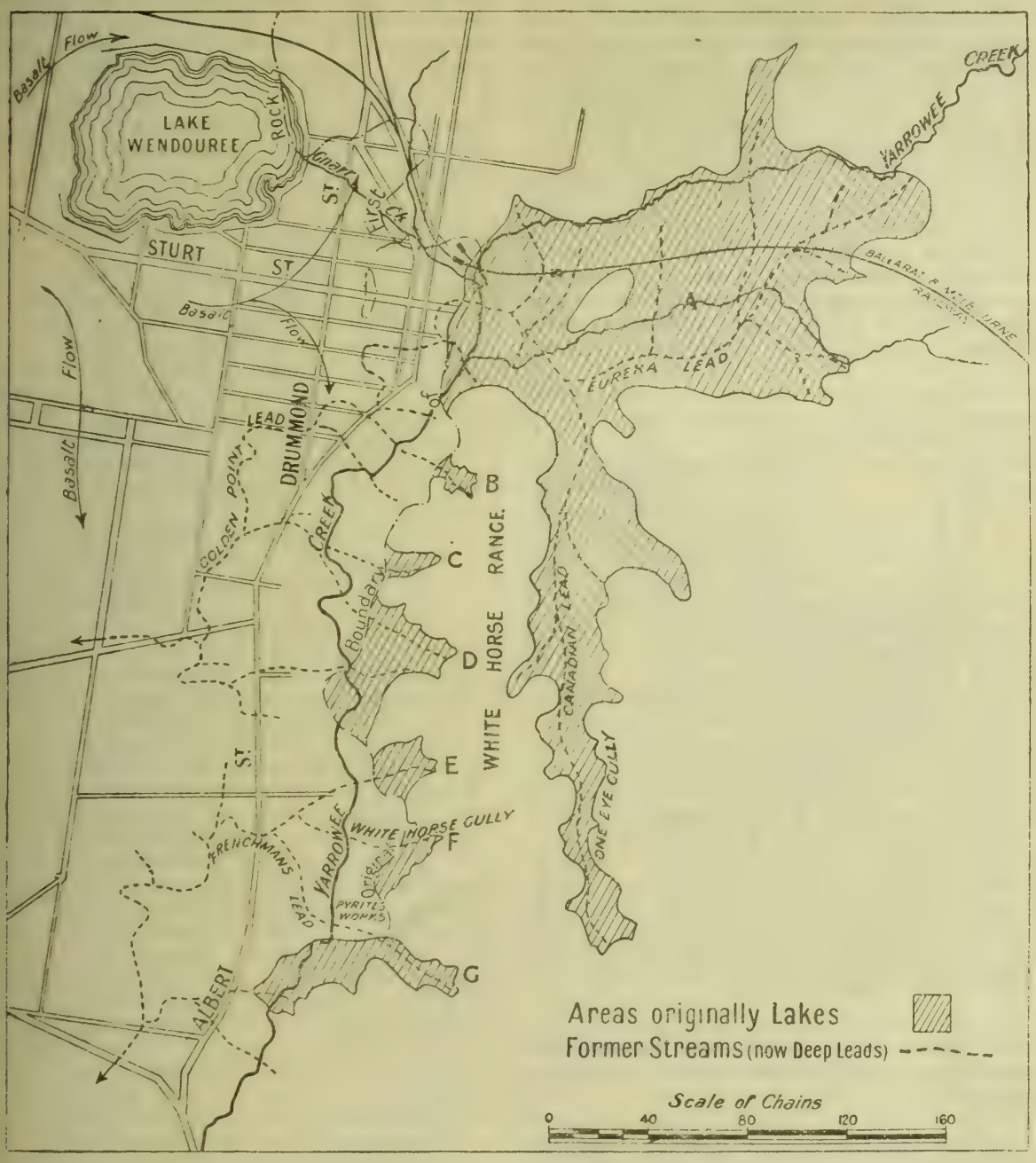



Fig. 4. Lakes formed by the Basalt Flows of Ballarat West blocking the course of the streams. Subsequent to the cutting away of the outlets a large portion of the deposits filling in these lakes has been removed.

became a marginal stream and its higher or upstream part carved a channel through the accumulated gravels. The grades of the streams flowing into the lake were reduced, with the result that deposits accumulated along the banks of Little Bendigo Creek and One Eye Gully. When the outlet of the lake was lowered, denudation began along the margins of these formations.

The cutting away of the lake outlets was in all probability a slow process, and generally took place at a point considerably within the extreme limit of the basalt flow, thus leaving the isolated remnants of basalt which now overlie the deep leads on the eastern side of the Yarrowee Creek. Subsequent denudation, while removing great quantities of the newer gravels, also removed the

Below the woollen mills, about 1 mile below the outlet of the lake mentioned above, the Yarrowee continued to carve out its channel, while the portion occupied by the lake was protected from erosion; it has therefore cut its way further into the Ordovician strata, and a number of flats have been formed where there were formerly ridges between the various leads, such as Hughes's Flat and the one north of the pyrites works between White Horse lead and Frenchman's lead. Southwards from the pyrites works a small lake was formed against the basalt (*see* G, Fig. 4), its surface showing at about the 1,290-ft. contour at one period; whether this was the original limit cannot be settled. Abundant chips such as are found at the sites of aboriginal camping-places occur along

the former shore-line of the old lake, and clearly mark points where the natives congregated, but above or below this limit the chips are rare.

As the outlet of the infilled lake lying north of Ballarat was not at a sufficiently low level to allow of denudation, this alluvial tract affords an insight into the conditions which probably existed over the greater portion of the area now embraced by the Yarrowee Creek and adjoining flats. On a smaller scale the damming by the basalt of the Inkerman lead (Fig. 5) has led to the accumulation of an extensive deposit of newer drift, while the present stream, Gnarr Creek, has taken a course partly marginal and partly over basalt and Ordovician beds, but has not cut very deeply into either; near its junction with the Yarrowee it exhibits the steep fall and V-shaped valley of a




Fig. 5. Plan illustrating the damming back of the Inkerman Lead by the basalt, causing an extensive deposit of newer drift. Scale: 40 chains to 1 inch.

young stream, while in the upper portions the grade is less steep and the valley is broad or U-shaped.

The final stage of denudation, which is still in progress, began with the lowering of the lake outlets. Waterfalls were probably in evidence; the clays and drift separating the upper basalt flows would offer little resistance to the falling water and the roughly columnar structure in the basalt itself would enable the work of destruction to proceed rapidly. So long as the streams could carry away more detritus than they received the channels were deepened; but with a more rapid accumulation, alluvial flats were formed. While this was going on, the smaller branches gradually cut their way back into the old peneplain. The best example is the V-shaped valley of the Gong Gong Creek, whch has captured the heads of an east-flowing system of streams probably dating back to the peneplain stage and certainly to the deep-lead period. The capture of these streams was aided in no small degree by the marginal stream along the edge of basalt which flowed from Wombat and Green Hills over the peneplain between Dean and Warrenheip. The upper portion of Yarrowee Creek near the Gong Gong Reservoir is deeply entrenched, and here again the change in the course of the streams is due to the lava flow.

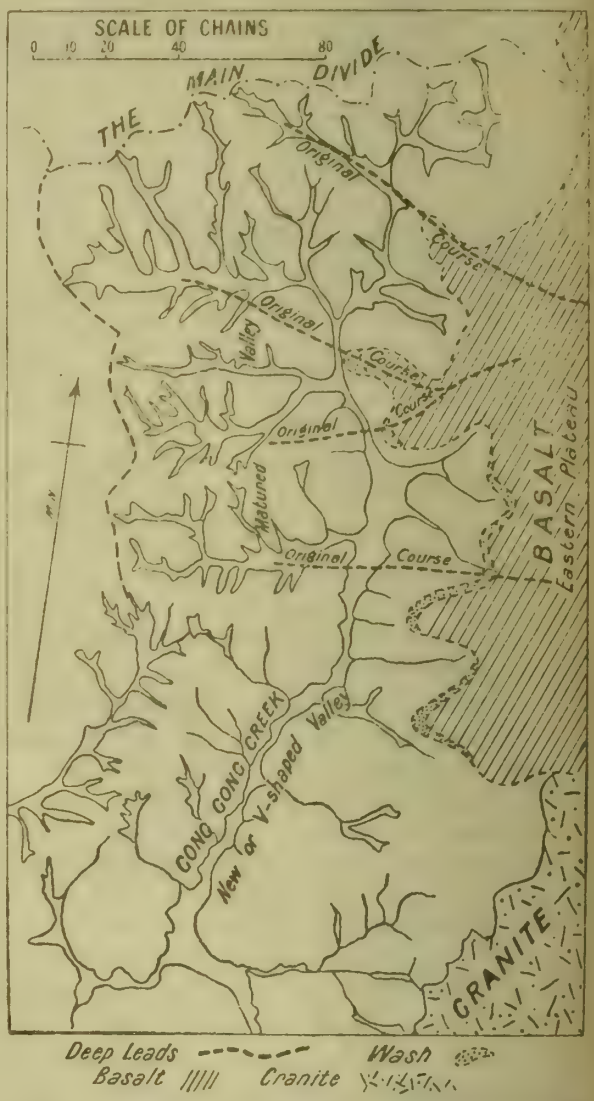



Fig. 6. Capture by Gong Gong Creek of older streams.

The old deep lead along part of the Yarrowee Valley had a steeper grade than the present stream; near the junction of the Gong Gong and Yarrowee Creeks the head of the lead is about 30 feet above the creek, while a little over 3 miles further downstream the deep lead passes under the Yarrowee Creek at a depth of 195 feet. In One Eye Gully the grade is also steeper, but the difference amounts only to about 100 feet in 3 miles.

# HISTORICAL (1851 TO JUNE, 1918).

The history of alluvial mining at Ballarat may be subdivided into the following stages:—(*a*) The discovery of the gold-field, 1851; (*b*) the early digging days, shallow alluvial, 1851-4; (*c*) the working of the deep leads, 1855-1872; and (*d*) the decline of the alluvial mines, 1873.

Concurrently with stages (*b*), (*c*), (*d*) of the alluvial, quartz mining was introduced, and the change from an alluvial to a quartz mining field, though gradual, was complete. The various stages in the development of quartz mining were—(*e*) early attention devoted to the matrix of the gold, 1852; (*f*) the reduction of quartz by machinery, 1853; (*g*) the quartz boom at Ballarat East, 1859; (*h*) the development of the Ballarat East mines, 1860-1915; (*i*) the discovery of the Consols lode, 1879; (*j*) the boom in the Star of the East and adjacent claims, 1886; and (*k*) the decline of mining at Sebastopol, 1908.

In the following lines the happenings of the various years are summarized; details of the mines are given under separate headings.

It has fallen to the lot of but few inland cities in the new world to furnish such a striking example of rapid growth from primeval bush to a well-established city, as did the development of the Ballarat gold-field within a quarter of a century of the first rush.

Settlement in the Ballarat district for pastoral purposes took place about 1836, Messrs. Learmonth, Yuille, Anderson, Archibald, and Waldie taking up an area which embraced the gold-field included in this survey. The aspect of the district at this time has been described as "of charming picturesqueness." The hills, in part, were covered with dense forest, the plains with scattered trees, while the flats along the banks of the creek and branch gullies were clothed in luxuriant grass. Permanent waterholes along the course of the Yarrowee Creek provided a continuous water supply for the requirements of the few settlers and their stock. Aborigines were few, but, with the advent of the settlers, the natives gathered in numbers and camped on the runs, at times becoming troublesome. Beyond the formation of a small hamlet at Buninyong, some 7 miles southerly from Ballarat, about 1851, but little change took place during this period, a few teamsters and station hands being the only inhabitants. A main road or track from the out-stations near the Grampians to the seaboard at Geelong lay along the site of the present Sturt-street, and followed the eastern bank of the Yarrowee for some miles before crossing the range to Buninyong.

Slowly, however, as the pastoralists spread to more distant parts, the township of Buninyong became important as a centre for the outlying stations, and later played a prominent part in the State's mining history. The working of rich alluvial gold-fields in California and also in Europe at the end of the forties of last century led to the search for the precious metal throughout the civilized world, and thousands of miners, attracted from various parts on learning the conditions under which the gold was obtainable, sought fresh fields. Almost simultaneously, considering the slow means of communication, in 1851 the discovery of gold was reported from three or four places in the State, and soon the hitherto quiet villages were astir with eager prospectors. Although recorded as having been discovered in 1843,[1] the first authentic find was probably that of Esmond at Clunes. Prospectors were making their way to this place from Buninyong, when, in August, 1851, payable gold was found at Golden Point. Soon the quiet pastoral area became the scene of busy excitement, and men of all callings and nationalities flocked to the new Eldorado. Two parties claimed the distinction of being the actual discoverers of gold at Ballarat, and, as their finds were separated by but a few hours at most, it may be definitely stated that Connor's party and Merrick's party were the discoverers of gold on the 24th or 25th August, 1851, at Golden Point. Both of these parties were on their way to Clunes, but were prospecting for some few days at Hiscocks, near Buninyong. News of rich ground found within the next few days soon spread, and within five weeks 500 men were at work on the site of the present city. The mining population was by no means a fixed one, for many, even when on good ground, deserted their claims hoping to better their chances on new fields. Thus it is recorded that "on the 15th November, 1851, Ballarat was nearly deserted. All the miners were leaving for Mt. Alexander."[2] As, however, the sensational discoveries on the various fields were reported at Melbourne and Geelong, men flocked from the towns and settled on the gold-fields, but upwards of a year elapsed before Ballarat again became attractive, as the result of the discovery of nuggets unequalled in size and number in any part of the world (*see* p. 102-104 for some nuggets), the rich shallow fields of Bendigo, Castlemaine, Mt. Korong, and the Ovens meanwhile commanding attention.

The general aspect of the locality was soon changed; "the green banks of the Yarrowee were lined with tubs and cradles, its clear waters were changed to liquid yellow as the yellowest Tiber flood, and its banks grew to be long shoals of tailings."[2]

Licences to dig for gold were first issued on 1st September, 1851. The cost was £18 per year, and the tax, though not meeting with general approval, was paid by the more fortunate of the miners. The first licence was issued at Ballarat on 20th September, 1851.

The shallow diggings were rich. The yields from thousands of the shafts will never be known. Many of the miners returned to their native lands taking the gold with them. Of the few recorded yields the following may be cited—"Messrs. Esmond and Cavanagh marked off a claim, depth of sinking 6 feet, from which they washed 50 lb. weight of gold in two days. Connor's party from the 25th August to 2nd October, 1851, obtained 340 oz. of gold."[3] Governor Lonsdale in October, 1851, "saw 8 lb. weight of gold washed from two tin dishes of dirt, and heard of a party that raised 16 lb. at an early hour and 31 lb. in all that day, many parties of four sharing day after day 10 oz. per man."[4]

Most of the digging was for some time carried on at Golden Point, near the site of the original discovery, but with the increased population and the depletion of the auriferous ground, the adjoining ranges and gullies were prospected, and still richer wash was met with.

The shallow diggings on the hill slopes soon gave way to the deeper ground in the flats, and, with the deeper ground the troubles incidental to alluvial mining arose. From broad scattered areas of washdirt on the hills the miners found

[1] Archibald Williams, *The Romance of Mining*, p. 71, Melb., 1912.

[1] Brough Smyth, *Goldfields and Mineral Industry of Victoria*, p. 63, 67.
[2] Withers' *History of Ballarat*, p. 36.
[3] Brough Smyth *op cit.*, p. 447.
[4] Withers, *op. cit.*, p. 38.

narrow defined runs, trending to the flats and there forming the leads of the deeper ground. Fortunately for the earlier miners, the united action of hundreds of workers, operating within a small area, prevented any difficulty arising from the accumulated water, and as the claims were usually small (from 8 feet by 8 feet up to 20 feet by 20 feet) the ground was soon worked out, and there was little need of timbering or risk of accident from falls of earth in drives or shafts. The small size of the claims also tended to equal distribution of good ground among the miners.

When two or more shallow tributary gutters or leads joined, the auriferous wash was found to be covered by a thicker overburden and was known as "deep ground." The junction of the leads was frequently found to be rich, above the average of either branch. Till deep ground was worked, manual labour or horse power had sufficed for mining operations, but with the deeper ground, with its larger claims and fewer shafts and miners, steam-driven machinery became essential.

Notwithstanding the increased cost and difficulties of working, the development of the gold-field progressed steadily. Even large bodies of drift, which appeared to block all efforts at shaft-sinking, gave only a temporary check in the working of the deeper ground. This deep ground was being worked by the end of 1852 from shafts upwards of 100 feet in depth. In 1853 the field began to assume a different aspect. The township of Ballarat was proclaimed in 1852, and the settled portion of the population located themselves on the eastern edge of an extensive basaltic plateau overlooking the diggings on the hills and flats to the east. Shaft-sinking with round timber and slabs was now recognised as an essential, and with this epoch of mining the "shallow ground" declined in importance. The course of the leads or "deep ground" became marked by lines of shafts across the broad flats, and the question of the continuation of the leads under the basaltic plateau to the west appears to have troubled the miners less than the scientists, some of whom regarded the basalt as a barrier at which the leads would terminate. Guided partly by local observations and partly by similar conditions at Creswick and Guildford, where leads had been proved beneath basaltic plateaux, shafts were sunk in the basalt in 1855. Prior to this, however, shafts on the flats had passed through a layer of basalt upwards of 50 feet in thickness before reaching the deep ground; the most easterly point to which this basalt (the "second rock") extends is indicated on the locality plan.

From this period onwards shaft-sinking became a difficult problem. The shafts, instead of piercing merely clays, gravel, and drift, had to be sunk through hard dense basalt with intervening layers of clay and drift, containing water under considerable pressure. Machinery became essential, and required to be more powerful as deeper ground and larger areas came to be worked.

An attempt was made to improve on the system of tenure under "miners' rights" by a new method of allotment of mining areas known as parallel or frontage claims. The miner's right gave the owner the title to a block of ground varying in size according to the depth of sinking; the frontage claims insured a given length along the course of the auriferous channel, the position of the claim being fixed according to priority of registration. That some improvement of the miner's right system was necessary there appears little doubt; but the new system proved a source of endless trouble and expenditure. Many costly law-suits resulted from the overlapping of frontages caused by the junctioning of various leads and from the working of leads for which the miners were not registered. In less than ten years there was a return to block claims of fixed areas held under lease from the Crown.

The following are the recorded dates of opening of various localities:—

| | | |
|---|---|---|
| Golden Point | ... | August, 1851 |
| Canadian Gully | ... | September, 1851 |
| Brown Hill | ... | September, 1851 |
| Black Hill | ... | October, 1851 |
| Little Bendigo | ... | October, 1851 |
| Eureka lead | ... | July, 1852 |
| Red Hill lead | ... | —, 1852 |
| Black Hill flat | ... | —, 1853 |
| Prince Regent | ... | February, 1853 |
| Sailor's Gully | ... | February, 1853 |
| White Flat | ... | May, 1853 |
| Gravel Pits | ... | June, 1853 |
| Scotchmans | ... | November, 1853 |
| New Chum | ... | —, 1853 |
| Black Hill lead | ... | —, 1854 |
| White Horse lead | ... | —, 1854 |
| Bakery Hill lead | .. | —, 1854 |
| Inkerman lead | ... | Early in 1855 |
| Red Streak lead | ... | March, 1855 |
| Frenchman's lead | ... | June, 1855 |
| Gum Tree Flat | ... | July, 1855 |
| Terrible lead | ... | August, 1855 |
| One Eye Gully | ... | September, 1855 |
| Pennyweight Gully | ... | September, 1855 |
| Nightingale Gully | ... | February, 1856 |
| Golden Point lead | ... | May, 1856 |
| Caledonian | ... | June, 1856 |
| Lady Barkly | ... | July, 1856 |
| Malakoff ... | ... | August, 1856 |
| Mt. Pleasant | ... | August, 1856 |
| Miner's Right | ... | September, 1856 |
| Esmond's lead | ... | October, 1856 |
| Cobbler's | ... | October, 1856 |
| Milkmaid's | ... | November, 1856 |
| Redan ... | ... | End of 1856 |
| A.1 ... | ... | July, 1857 |
| Haphazard | ... | —, 1857 |
| Swamp ... | ... | —, 1857 |
| Woolshed | ... | May, 1858 |
| Essex ... | ... | June, 1858 |
| Native Youth | .... | July, 1858 |
| Ashe's lead | ... | August, 1858 |

Extensive areas, which had been worked from shafts and then abandoned, were taken up once more for paddocking. In many instances steam puddling machines were used and much money was spent in the erection of plant, tramways and dams. At the Canadian, Prince Regent, Sailor's Gully and Black Hill much surface quartz and *débris* was thus treated during 1856 and for several succeeding years.

## 1856.

The population of the Ballarat gold-field and the immediate vicinity in 1856 was estimated to be between 40,000 and 50,000. Many thousands had amassed fortunes and left the field; many more were engaged in locating gold, while others, having been successful, had settled in the district. Substantial business premises were erected and social conditions kept pace with the general development. The crude implements of the early "diggers" had given way to the steam-engines of the "miners." The difficulties and dangers of mining had increased, but the ingenuity of the miners had overcome them. The laws regulating the

sizes of claims, &c., were modified to suit the changed conditions. The leads were worked in the deep ground beneath various layers of hard basalt with intervening drifts, and more time, money and labour were required to attain success.

The condition of the leads at the end of this year was as follows:—

The Eureka, previously the chief source of employment, was in the hands of a few Chinese, who treated with tub and cradle the *débris* of the early digger.

The Canadian lead had been turned over three, and, in some places, four times, and still provided employment on an extensive scale. The shallow ground on both sides also yielded payable results. The smaller leads, viz., the Prince Regent, Sailor's and Madman's Flat were being similarly treated.

The Gravel Pits lead, in which the first layer of basalt was encountered, had been traced under the basaltic plateau as a well defined gutter instead of the widespread field of wash met with on the flat to the east. The Golden Point lead was traced under the new township[1] and about 150 claims on the supposed course were registered. A fair return was obtained from the claims at work. On the Malakoff, Redan, and Miner's Right leads a large number of miners were at work, but the results were not satisfactory.

Following the course of the Yarrowee Creek downstream the Terrible lead was next in order, and up to this date it gave a fair return for the labour expended. Heavy water was met with in the sinking.

The White Horse and Frenchman's or Sebastopol leads were rapidly approaching each other (Figs. 7, 8). The returns, as below, from 27

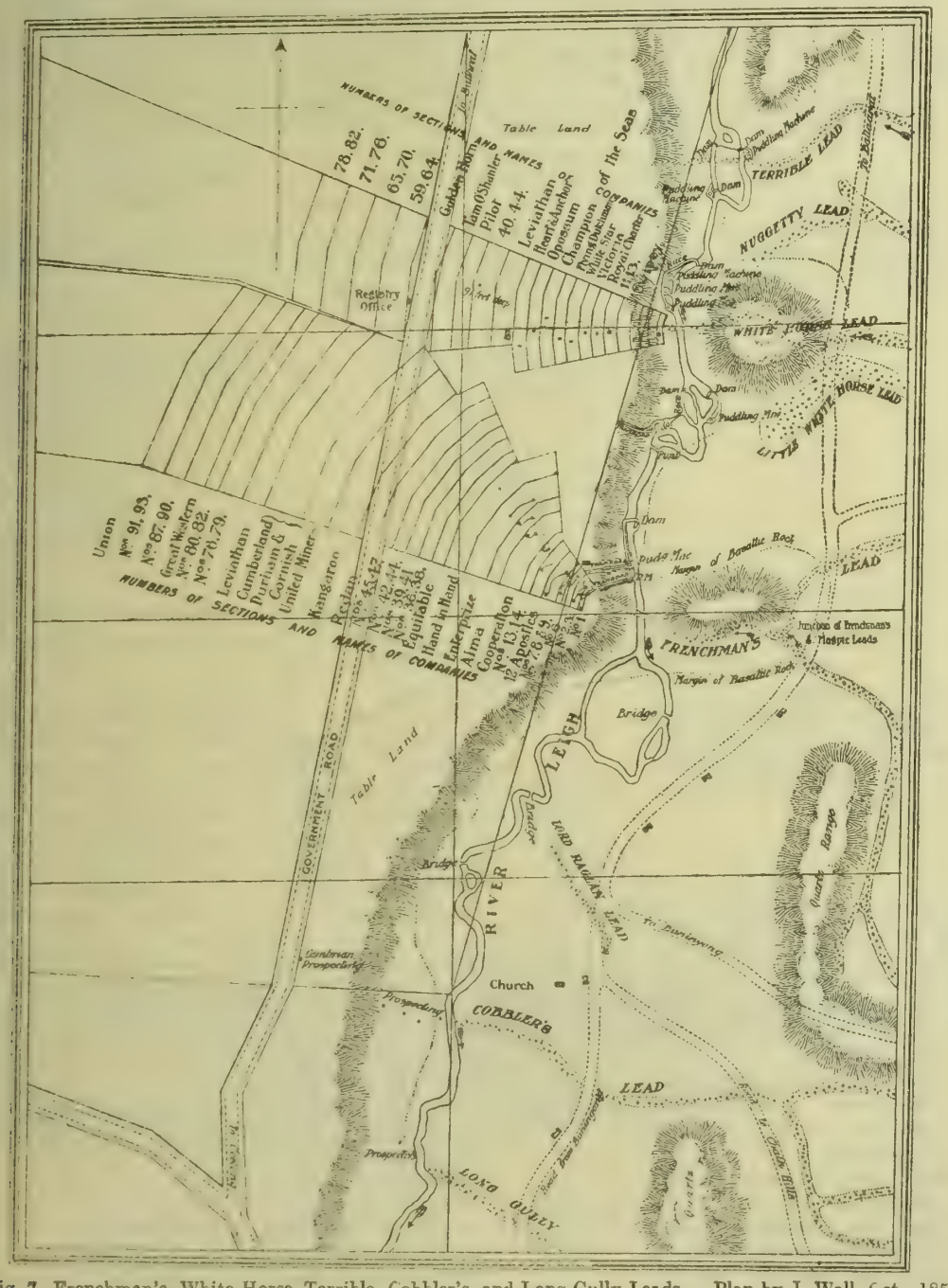



Fig. 7. Frenchman's, White Horse, Terrible, Cobbler's and Long Gully Leads. Plan by J. Wall, Oct., 1856.
Scale: 24 chains to 1 inch.

claims on the Frenchman's lead up to 20th November, 1856, amounted to £83,055; but even this sum left a deficit of £24,609. The size of claims was therefore increased so that the cost of shaft-sinking and other mining operations could be distributed over a larger extent of lead.

[1] The earliest township site was at Golden Point and in the neighbourhood of the main road, but in 1852 a township was marked out on the basalt plateau to the west with Lydiard and Sturt streets for a centre.

The following statistical table and note prepared by Mr. Wall, the then Mining Surveyor, give particulars of claims Nos. 1 to 27 registered on the Frenchman's lead:—

| No. of Claim. | Depth of Sinking.[1] | Basaltic Rock.[2] | Length of Drive to Gutter. | Sinking, Driving, and Other Expenses. | Net Produce of Claims |
|---|---|---|---|---|---|
| | feet. | feet. | feet. | £ s. d. | £ s. d. |
| 1 | 240 | 100 | 170 | 450 0 0 | 4,185 0 0 |
| 2 and 3 | 305 | 170 | 120 | 718 0 0 | 6,260 0 0 |
| 4 and 5 | 370 | 225 | 110 | 536 0 0 | 6,250 0 0 |
| 6 | 335 | 190 | 130 | 700 0 0 | 4,05? 0 0 |
| 7 to 9 | 380 | 210 | 270 | 700 0 0 | 9,000 0 0 |
| 10 to 12 | 440 | 250 | 90 | 2,000 0 0 | 12,000 0 0 |
| 13 and 14 | 400 | 220 | 50 | 710 0 0 | 3,710 0 0 |
| 15 to 19 | 800 | 430 | 110 | 1,000 0 0 | 9,100 0 0 |
| 20 to 22 | 584 | 331 | 210 | 900 0 0 | 9,000 0 0 |
| 23 to 27 | 912 | 641 | 370 | 3,050 0 0 | 19,500 0 0 |
| | 4,766 | 2,767 | 1,630 | 10,764 0 0 | 83,055 0 0 |

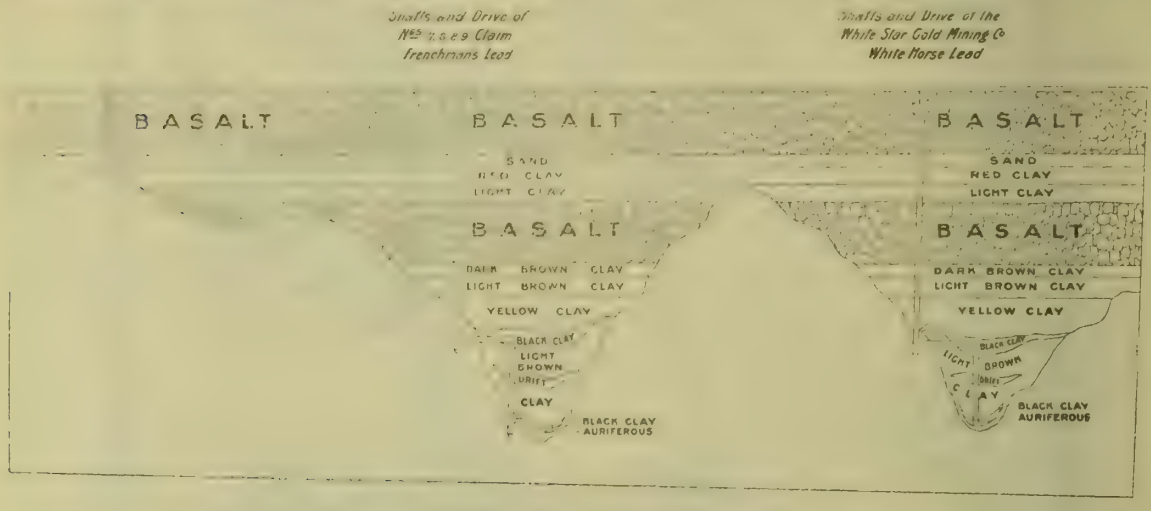



Fig. 8. Cross section of Frenchman's and White Horse Leads, Ballarat. By J. Wall. Scales: Horizontal, 12 chains to 1 inch; vertical, 150 chains to 1 inch.

"The ten claims have sunk through 2,767 feet of basaltic rock.

| | |
|---|---|
| Total for sinking, driving out claims, and other expenses ... | £107,764 |
| Less net produce .. .. | 83,055 |
| Deficit ... ... ... | £24,709 |

Average payment of gutter at 40 feet per claim and twelve men—£76 18s. per man."

As a rough indication of the gold won on the field, the following return of the amount forwarded to Melbourne in charge of the gold escort from September, 1851, to December, 1856, is given:—

| | oz. |
|---|---|
| 1851—From 21st September to 31st December ... ... | 30,323 |
| 1852—From 1st January to 31st December ... ... | 177,569 |
| 1853—From 1st January to 31st December ... ... | 319,099 |
| 1854—From 1st January to 31st December ... ... | 584,957 |
| 1855—From 1st Jaunary to 31st December ... ... | 769,429 |
| 1856—From 1st January to 31st December ... ... | 920,351 |
| Total to 31st December, 1856... | 2,801,728 |

The above return does not include the gold, which amounted to a considerable quantity, that was taken privately to the sea-board.

[1] The depth here given is the total depth of all shafts sunk in each claim.
[2] Total thickness pierced by all shafts in each claim.

## 1857.

The year 1857 was marked by vigorous shaft-sinking at Sebastopol. The junction of the White Horse and Frenchman's gutters was located, and below this point rich ground was worked. The Working Miners Company, at this date the most westerly on the supposed trend of the Frenchman's gutter, started shaft-sinking. Several of the claims above the junction of the two leads were worked out during the year. On the Cobbler's lead several parties were at work with encouraging results, but the lead had not been proved payable in the deeper workings. On the Gravel Pits lead the shafts on the fringe of the basaltic plateau reached payable deep ground. On the Golden Point lead, closely adjacent, the Clarendon, the Union, the Great Eastern, and the North Grenville companies barely returned the miners' wages on account of the small areas allowed, but new regulations enabled claims to be enlarged during the year. As a result of the same changes the Cosmopolitan and New Kohinoor companies, which in later days played a conspicuous part in the gold output, began shaft-sinking for deep ground. The Band of Hope Company, the most westerly to be marked out for the Golden Point lead, commenced boring operations to locate the deep ground. On the tributary leads, the Milkmaid, the Malakoff, the Miner's Right and the Redan, shaft-sinking was in evidence. On the Redan lead the Golden Gate Company encountered difficulties with water and drift, while to the westward the Great Redan Extended had begun sinking.

To the northward the discovery of rich gold in a tributary of the Inkerman, called the A1, led to prospecting in that locality and resulted in the deserted Inkerman lead being opened up and traced under the basalt. The shallow alluvial workings were now almost abandoned, the deep ground being the chief source of employment, and as the deep mines had not reached the productive stage, the gold yield decreased, only 686,263 oz. being sent away under escort during the year.

## 1858.

In the year 1858 the area prospected by the deep lead claims was further extended. The Essex Company to the north, and then the Swamp lead mines and the deeper workings on the Inkerman attracted attention. The A1 lead was worked out

after a short but successful career. On the Inkerman lead, the Allied Armies, the Ophir, the Independent, and the Great Republic had reached the gold-producing stage, while further down the lead the Royal Saxon, the Tannery, the Hand in Hand, and the Band of Hope companies were shaft-sinking. The junction of the Gravel Pits lead with the Golden Point lead was struck in workings on the former lead. The claims upstream, viz., the Old Gravel Pits, the Big Engine, and the Little Engine were on payable wash. The Waterloo Company on the Golden Point lead finished a successful career during the year. On the Golden Point lead the deeper shafts (the Kohinoor and the Cosmopolitan) were bottomed, and driving for the deep ground was begun. On the Malakoff lead the Great Eastern and the British companies reached the gold. The Golden Gate Company on the Redan lead was still engaged in shaft-sinking, much trouble being experienced with the water in the basalt. On the Frenchman's lead the Nelson Company was formed and both the Albion and the Working Miners companies were searching for the supposed continuation of the lead, while on the Cobbler's lead the Prince of Wales Company was engaged.

long been considered worked out and abandoned caused great excitement, and led to the re-working of much ground that gave no return.

Notwithstanding the output from the mines on the Inkerman and Golden Point leads a still further decline in the gold despatched by escorts was noticeable, the return for the year being 502,948 oz., as compared with 686,263 oz. for the previous year.

## 1859.

The year 1859 closed with a diminishing gold yield, and this falling off was not confined to Ballarat alone, for the outlying fields suffered in the same way. The gold despatched under escort amounted to 467,223 oz. The chief causes of the slackening were the exhaustion of the shallow alluvial systems and the delay in opening up deep ground owing to the time and capital required to overcome difficulties with water; quartz mining also had not yet been so vigorously developed as it had been at the Sandhurst (Bendigo) field,

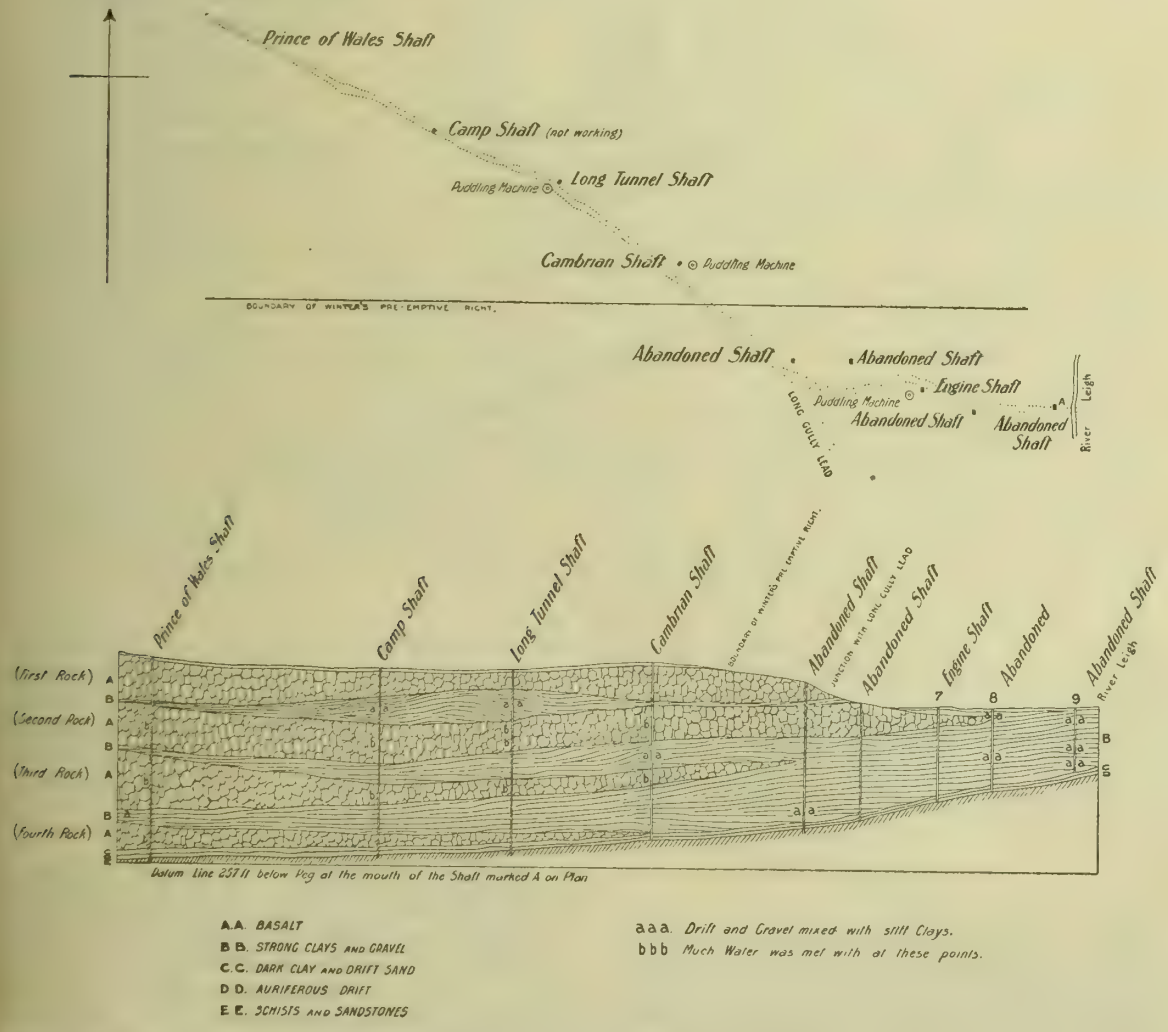



Fig. 9. Plan and section of a portion of Cobbler's Lead. Plan scale: 10 chains to 1 inch. Section scale: Horizontal, 10 chains to 1 inch; vertical, 300 feet to 1 inch. (For Long Tunnel read Long Funnel.)

A few new leads of small importance were located during the year amongst which the Woolshed on the eastern side of the Yarrowee Creek was the most notable. The discovery of the Welcome nugget during the year in ground which had

where at this time quartz reefing occupied a prominent position. The necessity for capital to equip the quartz and deep alluvial mines resulted in the formation of joint-stock companies, formed under "Ireland's Act," which permitted limited

liability partnership. No new alluvial leads were opened up in the Ballarat district. The Inkerman and the Redan leads afforded most employment and gave the best returns for the year. Quartz mining flourished on the Old Post Office Hill, good returns being obtained throughout the latter part of the year. The Black Hill Quartz Crushing Company continued to employ a large number of men, and its battery of 24 heads was the largest in the district, while the Last Chance, the Llanberris, and the Cornish United companies, on Gum Tree Flat, were entering upon a promising career. The Township reef on the north side of Sturt-street was taken up and a battery was erected there. A water supply for the gold-field was receiving attention.

dividend paying mines were the Black Hill, the Independent, the Enterprise, the Llanberris, the Last Chance, and the Cornish United. The record in quartz mining for the year was held by the Black Hill Company, which treated 15,256 tons of quartz for a yield of 3,890 oz. of gold; the company's works were situated at the foot of the hill and consisted of a battery of 24 heads of stamps. Large bodies of quartz were mined by open cuts and tunnels. The Yorkshire line of reef was opened up and yielded good results to the prospectors. The Township reef was worked to a depth of 220 feet and then changed hands. The output of gold from the quartz mines somewhat lessened the rate of decrease in the total gold yield.




Fig. 10. Plan of the Frenchman's Lead.

## 1860.

During 1860 quartz mining made rapid progress; new companies were formed to exploit all the known outcrops, and the once deserted gullies of the shallow alluvial miner were dotted with batteries. In the Ballarat district alone some 30 companies employed 350 heads of stamps. A yield of 3 dwt. to the ton in many cases covered all expenses, and good dividends were paid to shareholders from quartz yielding up to ½ oz. to the ton. From the Prince Regent Gully to the northern end of Black Hill, a continuous line of claims marked the outcrop of the quartz reefs and their extension under the alluvial flats. Prominent

In the alluvial mines rich ground was opened up during the year by the Great Extended Redan and the Royal Saxon companies. The Kohinoor, the Golden Gate, the Great Extended, the Royal Saxon, and the Independent mines paid large dividends. Much excitement was caused by the finding in the Kohinoor mine in the deep ground at 400 feet from the surface, on 27th July, of a nugget weighing 834 oz.; its source was ascribed to the Ballarat East line of nugget country. The striking of a quartz reef in the Burra Burra alluvial workings led the company to erect a battery of 50 heads, the largest in the neighbourhood. Outside capital was brought to the district to finance the more costly of the deep alluvial

mines. Litigation between rival companies was rife; of these lengthy, slow, and costly proceedings mention may be made of the triangular lawsuit between the Great Republic and the Hand in Hand and the Leviathan; also the suits between the Burra Burra and the Cosmopolitan, and between the Round Tower and the Red Jacket companies. An unsuccessful effort was made to float a company known as the Grand Trunk Leads Company to work a large area comprising the Inkerman, the Golden Point, the Redan, and the Frenchman's leads. Cobbler's lead was just being opened up after serious trouble with water. Inbursts of water and drift in the alluvial mines caused much inconvenience and delay. The Old

The course of the main leads after their junction had already attracted the attention of the miners and investors, and one theory, namely, the "great lagoon" to the west (*see* p. 50) is worth noticing, since it was prominent at this early period. A Sludge Commission, after a year's sitting, formulated a scheme whereby a main channel was made for the creek; this overcame the difficulties arising from the siltation of the tortuous course of the Yarrowee at White Flat, where the sludge from the alluvial workings had accumulated. A water supply for the district was secured by the Government purchasing a reservoir, known as Kirk's, which was the initial step in the formation of the present city water supply.

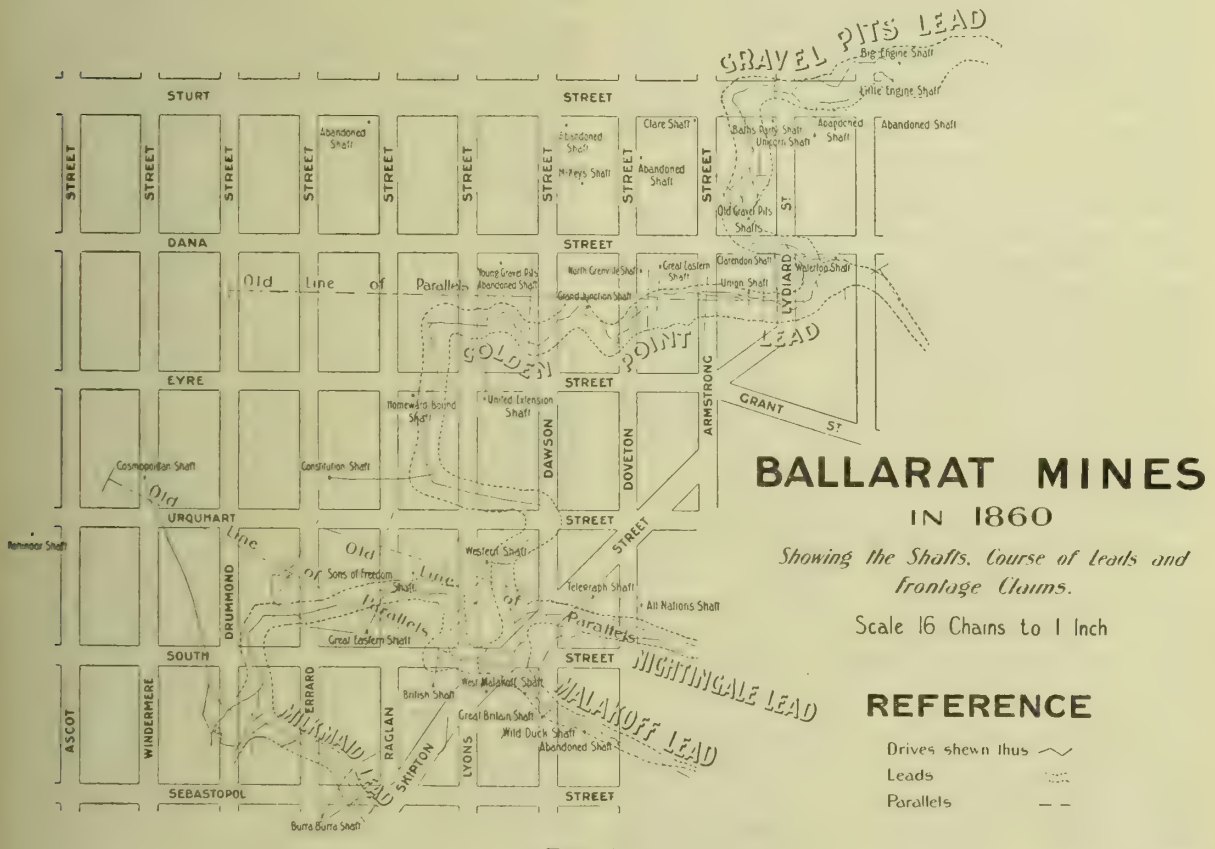



Fig. 11.

Gravel Pits Company, the last on the Gravel Pits lead, ceased operations early in the year. On the White Flat two companies were at work. A return prepared from the various companies' books gave the following values per running foot of the leads worked by them:—

| | Per foot. | Total. |
|---|---|---|
| *Inkerman Lead—* | | |
| Ophir Co. ... | £130 ... | £26,000 |
| Independent Co. . | £120 ... | £36,000 |
| Great Republic Co. | £93 ... | £28,000 |
| Royal Saxon Co. . | £58 ... | £8,000 |
| *Malakoff Lead—* | | |
| British Co. ... | £37 ... | £18,505 |
| Great Eastern Co. | £45 ... | £36,000 |
| *Golden Point Lead—* | | |
| Kohinoor Co. ... | £300 ... | £15,000 |

These figures can hardly be used for comparison since the expenses of shaft-sinking, overcoming difficulties with water, &c., varied in different mines and the width of lead in some cases was greater than in others.

The population at this date was settled, and incomes, though smaller, were not subject to the sudden fluctuations of the early digging days. The gold sent by escort from Ballarat proper for the year amounted to 248,325 oz.; the outlying fields of Creswick, Clunes, Smythesdale, and the newly opened Lintons district sent in an additional 183,375 oz.

## 1861.

During 1861 the deep alluvial leads again attracted attention. The successful bottoming, right in the gutter, of the Nelson's Company's shaft, after five years' struggle with water difficulties, and later on the striking of bedrock in the Working Miner's at a depth of 370 feet (after five years' labour involving a cost of £13,571) led to renewed interest in the ultimate trend of the main leads; it was now certain that they were limited to one or two courses, either to the west or to the south, opinions being equally divided in this respect. Early in the year the Bonshaw Company began to treat the washdirt and to pay dividends.

Excitement was caused by the striking of rich ground in the Royal Saxon mine at a higher level than the Inkerman lead, and the Mill Company opened up a short run which proved highly profitable for a time (*see* page 80). The Albion Company, after five years' search, struck the gutter. The Great Extended, the Golden Gate, the Great Republic, the Hand in Hand, the Kohinoor, and the Royal Saxon companies continued to have rich yields and to pay large dividends.

About the middle of the year, the rush to the Tuapeka and Dunedin gold-fields in New Zealand attracted many of the miners, with the result that the value of scrip fell and many of the smaller quartz companies closed down. By the end of the year the unrest subsided, but numerous quartz claims never re-opened. The returns for the year from the two largest alluvial claims were—Great Extended Company, 12,656 oz.; Cosmopolitan Company, 12,454 oz. The former employed 80 and the latter 40 men for the term.

One effect of the formation of quartz companies in the previous year was noticeable. "Wild cats," where machinery was erected without any hope of success or the stone was almost devoid of gold, were sold up during the year. The losses involved in these speculations arrested the progress of the quartz mining industry, but this was, in part, overcome by the payable results obtained elsewhere, notably by the Black Hill, the Cornish United, the Danish, the Llanberris, and the Canadian quartz mining companies. The Black Hill Company enlarged its claim during the year, purchasing among other blocks one of 46 feet along the line of lode at a cost of £2,000, or £43 10s. per foot, which price was regarded as reasonable. By the end of the year the company had nearly completed a 60-head battery, the largest then in the colony; to drive this an 80 h.p. engine, supplied by four Cornish boilers, was installed.

The Canadian Quartz Mining Company showed what could be achieved by systematic methods, paying a substantial dividend, as well as all the costs of erection of plant and working expenses, from ore which averaged only $2\frac{3}{4}$ dwt. of gold per ton.

Litigation between the deep lead companies continued, two new parties—the Hand in Hand and Southern Cross companies—becoming embroiled over an application for permission to mine under Lake Wendouree. A triangular suit between the Great Extended, the Band of Hope, and the Kohinoor companies was exceptionally costly, and engaged the services of seven barristers. The suit was partly settled by an amalgamation of two of the parties, the Great Extended and the Band of Hope, but their combined efforts were next pitted against the Kohinoor.

The value of the mining plants on the field at the end of the year was within a few pounds of half a million sterling.

The gold yields for the year were—

| | | |
|---|---|---|
| Ballarat proper | ... | 244,631 oz. |
| Ballarat district | ... | 417,479 oz. |

The Bendigo district during 1861 produced 274,314 oz.

## 1862.

Excluding the Sebastopol district, where 20,000 people were located, the population on the Ballarat East and West fields at the end of the year 1861 was 22,104, slightly less than that of Geelong, but far above that of any of the other Victorian gold-fields. The collapse of the New Zealand rush and the consequent return of miners to the district led to the revival of local ventures. The deep alluvial mines, having overcome the difficulties arising from water and shaft-sinking, were in a position to employ many miners. One of the prominent gold producers of the previous few years, the Golden Gate Company on the Redan lead, having worked out the gutter within the confines of the claim, suspended operations. During three years this company won 31,059 oz., valued at £123,026, from the deep ground with an initial expenditure of £18,110. The Great Extended Redan occupied a prominent position throughout the year and yielded as much as 361 oz. from a day's washing. The Kohinoor Company maintained a steady output, occasionally meeting with numerous nuggets, which ranged up to 60 oz. in weight; one of larger size, weighing 320 oz., was unearthed in March and was named the "Sir Dominick Daly." The Cosmopolitan Company, after completing unproductive work, again entered upon a gold-producing career. Operations at the Great Republic revealed a tributary lead which was styled the Republican; it proved exceptionally rich when first opened out, and yields ranging up to 240 oz. of coarse gold to the machine were obtained from a body of wash upwards of 10 feet thick. The Royal Saxon continued with varying success, and paid regular but smaller dividends than the above-mentioned companies. The Mill Company working on the National lead, a tributary of the Royal Saxon, afforded a striking example of "booming"; the register consisted of 30 holders; in June the shares were valued at £750 each, but by the end of the year the mine was worked out and closed down, together with the adjacent claims known as the British Workman, the Clifton, and the Wheatsheaf. New leads were located at Sebastopol in the course of mining operations. In the Nelson mine a new lead was proclaimed in April and named the Nelson and Wellington; this lead had a southerly course and was regarded by some as the continuation of the main Golden Point gutter. The Prince of Wales Company, on Cobbler's lead, found that the lead ran into another channel and applied for registration on this channel, which also was given the credit of being portion of the main system. This lead was proclaimed in September as the Prince of Wales lead. As an instance of the extent of mining enterprise in these times, the case of the Bonshaw Company may be mentioned. This company, prior to beginning operations, purchased for the sum of £20,000 the freehold property of Mr. John Winter, embracing about 640 acres. The Prince of Wales Company entered the list of dividend-paying mines in April, and shortly afterwards discovered a quartz reef in the alluvial workings. A trial crushing proved the quartz to be payable, and the company erected a complete crushing plant and sank the shaft 388 feet deep (35 feet below the alluvial drive) to operate on the quartz. In June a new company, the Waterloo, commenced operations on the south side of Dana-street, east of Lydiard-street, to work the continuation of the lead proved by the Clydesdale Company nearer the creek. The Albion

Company by the end of the year had met with success, after a long period of prospecting, and east of the shaft it proved a rich gutter which yielded as much as 300 oz. to the machine in December.

The course of the main lead was still in doubt, and the question was further complicated by the discovery of branch leads in the various mines at Sebastopol; the belief that the Frenchman's lead trended northwards still further added to the difficulty of the question.

The mines on the Malakoff lead (the Great Eastern, the British, and the Triumphant), reworked the old ground which had hitherto been only partly tested in the anxiety to locate the richest portion, and fairly remunerative returns were won during the year.

The monthly returns showed a gradual increase on those of the preceding year. This was due to the increased number of alluvial mines and also to the output from the quartz reefs.

Owing to the methods adopted by the alluvial miners trouble still arose from inbursts of water, and several of the mines were compelled from this cause to suspend operations for a time.

Fossickers in the abandoned shallow alluvial sometimes met with success. One party working near the Prince Regent Hotel, got from £20 to £30 per man per day for a time. The Windsor Company, a party of eight men, owning a puddling machine, got £10,000 in four years by working to a depth of 12 feet at Pennyweight Hill; after paying all expenses the profit was £976 per man.

In December a party unearthed a nugget of 229 oz. near the site of the old "Jeweller's Shop," and also another piece weighing 3 lb. in the same locality.

The Great Extended Redan Company, working near the Kohinoor boundary, found a nugget of 129 oz. in November.

Quartz mining for the year was more business-like and the boom flotations of the preceding years had collapsed. Economy in production was resorted to in every instance, and in many mines low grade ore was profitably worked. The Majestic Company at Black Hill treated a quantity of puddling machine refuse for a return of 1 dwt. to the ton. The Black Hill Company's working costs amounted to 6s. 6d. per ton; this company employed 90 men, and worked from an open cut which attained a depth of 70 feet during the year. The Burra Burra Company was unable to make ends meet on their low average yield and closed down. The Old Post Office Hill Company kept up average yields from shallow workings, while the Cornish United at 240 feet and the Llanberris at 200 feet supplied stone from the deepest levels in Ballarat East. During the year the Llanberris Company crushed 6,570 tons for 2,623 oz. 17 dwt. of gold, or 8 dwts. to the ton. On the White Horse Ranges the New Perseverance paid dividends on an average return of 1 dwt. 16 gr. of gold per ton. The Canadian Company had the lowest average yield, only a trifle over 1 dwt. per ton. On the Black Hill the Surprise, the Majestic, the Little Two Ton, the Criterion, and the Independent companies were at work. Three-dwt. quartz was now regarded as sufficiently good to yield a fair return on a moderate outlay.

Litigation among the alluvial companies continued. Frontage rights registered on the main leads or tributaries, together with the rights on the junction leads formed by the confluence of two or more streams, provided matter for legal warfare. The triangular law-suit between the Great Extended, the Band of Hope, and the Kohinoor companies continued. The Great Extended sued the other two conjointly; then the Band of Hope and the Kohinoor had a suit between themselves; the Extended and the Band of Hope afterwards made a compromise and effected an amalgamation contingent upon a previous arrangement between the Band of Hope and the Kohinoor, but owing to the dispute between these companies the law was again set moving and litigation was continued throughout the year. When settled at last, the arrangements made for the amalgamation involved the payment of over £23,000 by the Extended Company for its share in the new company (*see* p. 76).

Other mines as well, during the legal disputes, were worked by the Court. The Nelson and the Red Jacket companies thus worked the disputed area for fourteen months, and at the end of that time the Court of Mines divided the gold obtained —10,091 oz.—between the rival parties after deducting the working costs, &c., which amounted to 25 per cent. of the yield. This area of wash averaged 1 oz. 15 dwt. 2 gr. per cubic yard.

The following table shows the number of shares in the various companies working deep ground, and their market value in June, 1862:—

| — | Shares. | Value per Share. | Total Value. |
|---|---|---|---|
| | | £ | £ |
| Great Extended Redan .. | 80 | 2,700 | 216,000 |
| Kohinoor .. .. .. | 40 | 2,300 | 92,000 |
| Royal Saxon .. .. | 40 | 1,200 | 48,000 |
| Cosmopolitan .. .. | 42 | 1,800 | 75,600 |
| Nelson .. .. .. | 72 | 1,000 | 72,000 |
| Prince of Wales .. .. | 64 | 1,500 | 96,000 |
| Working Miners .. .. | 57 | 1,500 | 85,500 |
| Albion .. .. .. | 72 | 1,400 | 100,800 |
| Mill .. .. .. | 30 | 750 | 22,500 |

During the year the railway line from Melbourne, *viâ* Geelong, was completed, the coaching days came to an end, and the escort returns were no longer published. The gold yield, so far as ascertainable, for the period was—Ballarat proper, 244,500 oz.; Ballarat district, 409,000 oz.

The output from some of the alluvial mines on the deep ground amounted to—

| — | Shares. | Gold Won. | Total Weekly Expenses. | Dividends per Share. |
|---|---|---|---|---|
| | | ozs. | £ | £ s. d. |
| Great Republic.. | 80 | 9,055 | 109 | 370 0 0 |
| Royal Saxon .. | 40 | 5,984 | 150 | 397 15 2 |
| Cosmopolitan .. | 42 | 7,136 | 131 | 538 16 0 |
| Kohinoor .. | 40 | 14,269 | 236 | 1,110 0 0 |
| Great Extended Redan | 80 | 17,222 | 268 | 705 0 0 |

## 1863.

Throughout 1863 the rush to New Zealand again attracted many of the miners, and this, together with the inadequate water supply to the town and litigation in the principal mines, caused mining generally to suffer during the greater part of the year. Attention was now being paid to the north-west portion of the field northwards of Lake Wendouree, where much work was done on the Essex or Suburban and the Swamp leads, with good results in the case of the Essex Company, though lengthy drives by the Garibaldi and the Durham companies had not so far been successful.

Among the old established companies on the deep leads, the Great Extended, the Kohinoor, and the Cosmopolitan occupied prominent positions, and further south the Defiance and the Nelson companies were coming to the front in the dividend list. On the Inkerman lead, the returns from the Great Republic and the Royal Saxon improved. The Band of Hope Company, which had erected a plant on the old Golden Gate shaft and enlarged the original shaft, was engaged in shaft-sinking for the Golden Point lead. The companies working old ground and the reef wash on the Malakoff lead, viz., the Great Eastern, the British, and the Triumphant, ceased work during the year. A few parties of puddlers now had possession of the whole of the shallow alluvial ground.

While their returns were not to be compared with the mines working the deep alluvials, the quartz companies at work along the ranges of Ballarat East gave a fair return on the capital involved. At Black Hill the cutting on the crown of the hill was now 70 feet deep. The Llanberris mine became the property of Learmonth Brothers. Low-grade ore was still being worked; during March the Victoria Company (previously the New Perseverance) on the White Horse Range, crushed 2,000 tons for 124 oz. of gold, or 1 dwt. 5¼ gr. to the ton, and made a profit. The New Speedwell Company re-organized, and the tribute system, which was now gaining ground, was applied to the Wellingtonia, the Globe, and the London companies at Black Hill Flat.

Early in the year the Emerald Company (previously the Allied Armies) discovered a quartz reef in its claim in Greene's paddock, near Drummond-street, Ballarat West. The casing and loose quartz were washed in a puddling machine, and returned 58 oz.; and 93 tons of solid quartz treated at a battery yielded 22 oz. 16 dwt. of gold. This led the party to erect a small battery. At Sebastopol the Prince of Wales Company deepened its shaft to work the quartz. Early in the year the battery belonging to this company began crushing, and a steady output from the quartz was maintained during the year.

The total of quartz crushed in 1863 amounted to 286,577 tons, and yielded 70,466 oz., an average of 4 dwt. 22 gr. to the ton. The Llanberris Company, with 6,750 tons, crushed for 2,634 oz., valued at £10,584, headed the list, the average per ton being 7 dwt. 19 gr.

## 1864.

The locking up of extensive areas under registration as frontage claims and the shepherding in vogue on the deep ground prevented much development during 1864. Quartz and alluvial mining went on steadily, but with no marked advance. The Kohinoor continued to be the most important alluvial mine, and its gold yield considerably increased. The Band of Hope Company was amalgamated with portion of the Great Extended Company, and was renamed the United Extended Band of Hope. Quartz reefs were still being located in the alluvial mines; one, found by the Great Extended Company, yielded 12 dwt. to the ton from a trial crushing of 50 tons (this reef was worked in later days by the No. 4 shaft, Band and Albion Company). The Nelson and Wellington Company had a successful year, winning 14,942 oz. of gold, valued at £57,909. Nuggets were still found in the deep alluvial, two obtained during January in the Cosmopolitan mine weighing 111 oz. and 51 oz. respectively.

Three of the deep lead companies, viz., the Kohinoor, with 28,611 oz., the United Extended Band of Hope, with 17,399 oz., and the Great Extended Redan, with 15,873 oz., turned out gold for the year valued at £250,000. The claims on the Essex and Swamp leads continued to attract attention by reason of inviting prospects, but the high anticipations were not realized.

Quartz mining at Ballarat East was without any marked change. The Black Hill and Independent companies treated a large quantity of low-grade stone, averaging 1 dwt. 11 gr. to the ton. The Llanberris, the Britannia, the Union, and the Old Post Office Hill companies were on ore of slightly better average quality, their returns averaging over 3 dwt.

## 1865.

The incoming of the year 1865 was marked by so many new ventures that legitimate trade was almost paralyzed. The western extension of the deep leads was now being exploited, the Essex, the Swamp, the Inkerman, and the Hand in Hand mines proving payable ground in that direction. The Band of Hope Company (United Extended Band of Hope) yielded 43,219 oz., worth nearly £175,000. The Kohinoor, the Great Extended, the St. George, the Prince of Wales, the Nelson, and the Albion companies were all good producers, but the Cosmopolitan and the Royal Saxon were on the down grade.

Quartz mining at the Burra Burra mine, at Ballarat West, gave promising results early in the year. On the eastern lines the Llanberris, the Union, the Old Post Office, the Britannia, and the Endeavour continued to mine to the maximum depth of 300 feet in the first-mentioned claim; the returns varied, but averaged about 3 dwt. to the ton. The Black Hill, the Two Ton, the Majestic, and Independent mines at Black Hill worked large bodies of low-grade ore to a depth of 150 feet from the surface.

## 1866.

The year 1866 was memorable in the history of deep lead mining at Ballarat, for in September of that year the frontage system of claim registration was abolished, and Crown leases for defined areas were issued; this not only tended to greater security of tenure, but enabled the miners and speculators to expend time and money in opening up mines without fear of litigation and other losses. With the passing of the frontage system the miners took a hand in the settlement of disputed grounds, and there were numerous cases of underground warfare and the adoption of tactics involving not only temporary loss, but also loss of life. With greater security of tenure, speculation rose to a high pitch; claims and shafts were marked out in all likely positions on the western portion of the field. The discovery of rich ground by the Sir William Don Company led to a large number of claims being pegged out to the west; among them was the Newington, in which was discovered a field of rich wash. The Western and the Ballarat Freeholds Companies were engaged in shaft sinking. At Redan a new company, called the Golden Gate, was formed to work old abandoned ground. Winter's Freehold Company commenced boring, and the Guiding Star, adjoining the St. George, was shaft sinking. The Band of Hope, the Sir William Don, the Albion, the Prince of Wales, the St. George, the Kohinoor, and the Great Extended Redan companies were consistent gold producers, and conjointly returned for the year 143,644 oz. of gold, valued at nearly £590,000. The Great Extended Redan Company began to sink a new shaft, and went off the list of gold producers before the end of the year.

In quartz mining but little change was noticeable. The yields of the Endeavour Company fell away, but the output of the Llanberris was considerably increased. The Majestic and Black Hill companies, at Black Hill, had success. The Two Ton Company maintained its low average—only 2 dwt. to the ton—throughout the year. The returns from the Old Post Office Hill Company improved, and the largest tonnage treated to date was put through.

## 1867.

In 1867 the boom which manifested itself during the previous year was maintained. Large yields were won from the alluvial mines, among which the chief contributors for the year were—

| Mine. | Gold Yield. oz. |
|---|---|
| Band of Hope .. .. | 57,080 |
| Albion .. .. .. | 29,486 |
| Prince of Wales .. .. | 31,535 |
| Kohinoor .. .. .. | 13,071 |
| Newington .. .. .. | 21,513 |
| Sir William Don .. .. | 26,399 |
| Ballarat Freehold .. .. | 17,806 |
| | 196,890 |

The value of the output was over £810,000.

On the 25th July, 1,054 oz. 15 dwt. was won by the Band of Hope Company; this was the largest yield (exclusive of nuggets) till then recorded on the field for a day's work, but it was exceeded later in the year, on Thursday, 1st August, when the day's clean up resulted in 1,637 oz. The same company had a still larger return for a single day's work at a later date, but no other alluvial mine approached such returns. Between the 24th of June and the 14th of August of this year (44 days) 14,975 oz. 17 dwt. was won. The No. 3 shaft of the company, situated near Smythe's road, bottomed during the year, and enabled the company to maintain a large output.

Among the smaller ventures floated during the year was the Great Northern Freehold, situated off Drummond-street, near Webster-street; it carried on operations in the neighbourhood of abandoned ground on the Inkerman lead, and began to pay dividends at the end of the year. The Park Company was formed in November, and secured that portion of the United Hand in Hand and Band of Hope Company's ground, which was situated within the park, and which contained that company's No. 3 shaft; this shaft was now used as the Park Company's No. 1 shaft. Nuggets were not as plentiful as in previous years, in spite of the larger gold yield from the alluvial mines. The largest (90 oz.) was secured by the Lady Don Company, and another, weighing 85 oz., by the Ballarat Extension Company.

The quartz mines of Ballarat East continued to prospect at shallow depths. The Old Post Office Hill Company suspended operations during the year, but set to work again after a period of four months; the average return from the ore treated was only 1½ dwt. of gold per ton. The Llanberris Company had the most successful year of its career, winning 3,815 oz. from 22,224 tons crushed. The Endeavour Company doubled its previous year's output. The Black Hill Company's yields improved, and the Two Ton also gave a better average return. The Majestic Company was on the down grade. At Canadian Gully several claims were being opened up, and expectations regarding this quarter ran high.

## 1868.

In consequence of the abolition of the export duty, the price of gold in 1868 was advanced 6d. per oz., making the value on the field £4 0s. 9d. for alluvial, and £4 1s. 6d. per oz. for bar gold. Among the host of smaller ventures floated during the boom of the previous year, the Webster-street Freehold gained prominence on account of striking rich wash at a depth of 60 feet near the old Inkerman lead. The first day's sluicing yielded 1,010 oz., but this was not maintained, and the rush was short-lived. The Great Northern Freehold continued to yield well. Among the deep alluvial mines the Band of Hope again headed the list. In February this mine divided £24,000 for the month, and advanced £12,000 for development and other works at No. 3 shaft; in February and March the returns were very large, including 2,832 oz. for one day (7th March, 1868), and 4,668 oz. 15 dwt. for one week, both records for any mine in the State. Surveys proved that the lead worked by the Albion Company was 10 feet above the lead in the Band of Hope Company's No. 3 shaft. An amalgamation was effected between the Albion and the Band of Hope Companies, resulting in the formation of

the Band of Hope and Albion Consols. Portion of the Band of Hope ground merged with that of the St. George and Band of Hope United. The All Saints Company secured the Band of Hope Company's No. 4 shaft, and thus the litigation which had involved the Band of Hope Company for a considerable time was settled. The United Working Miners' Company obtained good returns and paid dividends. The claims on the Swamp and the Essex leads were still prospecting. The Kohinoor met with improved prospects in a tributary lead at 290 feet from the surface during the last quarter of the year. Winter's Freehold, to the west of Sebastopol, was purchased by a company for £50,000, and this area, together with a large tract of alluvial country to the north-west of Lake Wendouree, known as the Great North West, and a quartz claim of 500 acres on the Ballarat East line of country, was brought under the notice of English capitalists, but the projected company was not successfully floated. The pumping plant on the Great North West property, although at the time the largest in Australia, was inadequate, and the company was unable to bottom its shaft. The Hand and Band Company deepened the No. 1 shaft of the Band of Hope Company. The Cricket Reserve Company, after a short, successful career, was worked out. From its inception in 1857 till April, 1868, the Prince of Wales Company had paid £142,176 in wages, £36,697 for plant, £32,998 for timber and firewood, £5,429 for candles, £10,093 for stores, and £205,970 in dividends. The total outlay amounted to nearly £450,000. The group of mines in the vicinity of Pleasant-street was now worked out, after yielding as under—

| Mine. | Gold Value. | Dividends |
|---|---|---|
| | £ | £ |
| Sir William Don .. | 240,511 .. | 131,000 |
| Newington .. .. | 138,079 .. | 59,000 |
| Western Freehold .. | 110,439 .. | 55,350 |
| Ballarat Freehold .. | 123,404 .. | 38,250 |

Up to July, 1868, twenty-seven of the larger alluvial claims at Ballarat and Sebastopol had produced an aggregate of over 1,000,000 oz. of gold valued at £4,250,928. The principal producers were—

| Mine. | Gold Won. |
|---|---|
| | oz. |
| United Extended Band of Hope .. | 188,497 |
| Kohinoor .. .. .. | 123,188 |
| Great Extended Redan .. .. | 109,572 |
| Prince of Wales .. .. | 107,695 |
| Total .. .. .. | 528,952 |

The largest nugget for the year (93 oz. 15 dwt.) was met with in the Band of Hope mine, and several small nuggets were found in the Kohinoor.

Quartz mining steadily improved, good prospects were obtained from the Township line of reef, in Raglan-street, and some very rich specimens from veins in the New Mair-street claim. In the Guiding Star workings a quartz reef up to 14 feet thick was passed through, and a trial crushing of 50 tons yielded 33 oz. 5 dwt.

At Ballarat East the New Wellingtonia Gigantea Company was formed, and a block of stone within the railway reserve was worked. The Sovereign Company and the Queen Victoria Company, at Canadian Gully, prospected to a depth of 200 feet, with varying results. The Llanberris mine exhausted many of the proved makes of stone, and was on the down grade. The Old Post Office Hill Company suspended operations in part. The Independent Company, on Black Hill, had ceased work, and the claim was acquired by the Black Hill Company, which produced 5,224 oz., the largest output since 1862. Small yields were obtained in the Majestic Company. The Britannia had a slightly improved average yield, and the Endeavour Company won 833 oz. The Union Company, at the Old Post Office Hill, closed down after a chequered career of over six years.

## 1869.

The field of operation by the alluvial companies continued to enlarge. Winter's Freehold Company, which had begun to sink in 1868 after preliminary boring, bottomed its No. 1 shaft early in 1869. The shaft, which was sunk to 460 feet, was the largest in the colony, being 14 ft. 6 in. by 4 ft. 6 in. in the clear. No. 2 shaft was also bottomed and levels were opened out for prospecting. The Great North West Company was still in trouble with water in the "fourth rock," and after spending over £40,000 in endeavouring to sink a shaft, had the misfortune to lose its costly plant by fire. The Park Company won rich returns from an extensive field of deep wash. Boring by the North Park Company was in progress, and a great depth of basalt was met with. At Sebastopol, the Emperor and the Empress Companies were working on the western limit of the field. The Guiding Star Company closed down during the year.

The chief contributors to the gold yield were—

| Mine. | Gold Yield |
|---|---|
| | oz. |
| Band of Hope and Albion Consols .. | 46,400 |
| St. George and Band of Hope United .. | 12,030 |
| Kohinoor .. .. .. .. | 16,476 |
| Park .. .. .. .. | 28,769 |
| Bonshaw .. .. .. | 23,271 |
| United Albion and Prince of Wales .. | 10,252 |

Among quartz mining ventures, the old companies produced less gold, and the newer claims had not as yet proved anything payable. The Majestic Company raised slightly better ore. Returns from the Black Hill, the Llanberris, and the Endeavour Companies fell away. The Old Post Office Company treated low-grade ore and paid small dividends. The Queen Victoria Company, Canadian Gully, which crushed quartz averaging about 5 dwt. of gold per ton, began to pay dividends.

## 1870.

The year 1870 saw the turning point in the history of deep alluvial mining. The boom of the preceding years was followed by general depression. The loss (in paper value) on the scrip of companies in the neighbourhood of Ballarat was estimated at over £2,000,000. By the end of the year the depletion of the rich wash was apparent.

Many of the mines were now letting blocks on tribute to miners whose services the companies were unable to employ. The decreasing output is shown by the yields from the following important mines:—

| Mine. | Gold Yield oz. |
|---|---|
| Band of Hope and Albion Consols .. | 26,593 |
| St. George and Band of Hope United.. | 10,860 |
| United Albion and Prince of Wales .. | 8,313 |
| Kohinoor .. .. .. | 2,845 |
| Park .. .. .. .. | 28,083 |
| Bonshaw .. .. .. | 16,064 |
| Working Miners' .. .. .. | 3,090 |

Yields from the Hand and Band fell away considerably towards the end of September, but afterwards improved to such an extent that at the close of the year the mine occupied a foremost position. Small yields were being obtained by the Winter's Freehold Company, but the results did not fulfil expectations. The output of the Durham Company, on the Swamp lead, shrank to 2,491 oz. from 3,575 oz. in 1869.

In quartz mining there was little of interest. At Black Hill the Majestic Company ceased operations early in the year. The Two Ton Company crushed only small quantities of quartz. The Black Hill Company's output decreased to 13,687 tons for 1,385 oz., against 16,160 tons for 3,178 oz. in 1869. The Old Post Office Hill Company crushed 8,800 tons for only 615 oz. Yields from the Llanberris continued to decrease. The Endeavour Company, however, had the most successful year of its existence, and won 1,015 oz. from 4,534 tons of quartz. The Britannia also had a better yield, 614 oz. from 2,539 tons, compared with 461 oz. from 1,484 tons in 1869. A number of new claims sprang into existence in the Ballarat East belt, among them the Countess, the Duchess, and the Parade Companies, in the neighbourhood of the Britannia Company. The Sovereign Company was engaged in shaft-sinking. Small dividends were paid by the Queen Victoria Company, Canadian Gully. On the White Horse Ranges, the St. Andrew Company, whose claim was situated to the north of the present Woah Hawp No. 1 Mine, was engaged in crushing quartz which yielded under 1½ dwt. to the ton. The Tower Hill Company was formed and began operations at the southern end of the Ballarat East line of country.

## 1871.

In 1869 the population of Ballarat numbered 50,835, but by the end of 1871 it had shrunk to 44,650. The public generally, and more especially the mining speculators, were suffering from the collapse of the boom of past years; and this, together with the further exhaustion and abandoning of many of the chief alluvial claims, and the consequent water troubles in the adjacent mines, led to increased activity in the quartz mines. More than a third of the total gold output now came from the quartz reefs.

After the alluvial claims in the neighbourhood of Napoleons were abandoned, the water began to accumulate, and this led to a gradual swamping out of the mines higher up-stream.

The chief contributors to the gold output for the year were—

| Mine. | Gold Yield. oz. |
|---|---|
| Band of Hope and Albion Consols .. | 42,145 |
| Hand and Band .. .. .. | 23,997 |
| Park .. .. .. .. | 14,023 |
| United Albion and Prince of Wales .. | 9,208 |
| Bonshaw .. .. .. | 4,584 |
| St. George and Band of Hope United .. | 7,064 |

Winter's Freehold still attracted attention on account of rich prospects, but no defined lead was, as yet, met with. On the Swamp lead the Durham Company was re-organized as the City of Ballarat Company, and a new shaft was begun for working the western continuation of the lead.

Among the quartz mines the Old Post Office Hill Company ended its career. The Black Hill mine, now largely worked by tributers, gave an improved return. A successful year was experienced by the Britannia Company, which yielded 3,432 oz. of gold from 6,868 tons. The Llanberris Company continued on low-grade stone, 9,745 tons yielding 1,173 ozs. The yield from the Endeavour Company (731 ozs. of gold from 4,444 tons), while not as good as that won in 1870, was profitable. The Tower Hill Company treated quartz carrying from 2 dwt. to 4 dwt. of gold per ton from a depth of 120 feet.

The number of miners employed in the Central Division throughout the year averaged 4,980 compared with 7,255 in 1868. The output of gold, though much below the average, was better than it had been in the previous year, and dividends were also slightly better. The output, however, in three years had been reduced by over 200,000 oz., and the yearly dividends by over £360,000.

## 1872.

A further decline in the output from the alluvial mines was noticeable during 1872. The Band of Hope and Albion Consols occupied the foremost place as a gold-producer, and, though not as consistent as in former years, at times gave good returns, as, for example, one day's washing in August, which yielded 497 oz. The total output of this mine for the year amounted to 44,034 oz., and dividends totalling £62,299 were paid. The Hand and Band Company's yields fell to 11,090 oz. for the year, and only £2,560 was paid in dividends, compared with £33,800 in the preceding year. The Park mine ceased to be remunerative, the total product for the year being 2,657 oz. The Prince of Wales Company continued to pay its way and distributed £3,336 in dividends. The yield from the St. George and Band of Hope also fell away and left no profit. Winter's Freehold still continued to allure the investor; the return for the year was 6,534 oz. The output of the Bonshaw Company, which ceased to pay dividends in 1870, decreased to 2,205 oz. The majority of the alluvial mines now at work were abandoning the deep ground (the gutters) and paying more attention to the shallow ground (reef-washes) in the hope of better returns and smaller working costs.

In quartz mining but little improvement was noticeable. The Sovereign Company found gold-bearing quartz at a depth of over 500 feet, and this result of the pioneer deep-sinking in Ballarat East gave promise of the permanency of the field. At Black Hill, the Majestic Company crushed 3,600 tons for 538 oz. The Black Hill tributers

crushed quartz carrying ½ oz. of gold to the ton, and paid dividends amounting to £5,332. A number of parties were engaged prospecting on the Black Hill Flat, and rich veins were met with. Returns from the Britannia Company fell off considerably. The Don Company, which had been at work for three years at Gum Tree Flat, continued to mine a little quartz averaging about 4 dwt. of gold per ton. The Llanberris crushed more quartz and had a better yield. The Endeavour Company maintained the gold output of the preceding year, while treating a smaller quantity of quartz. The Queen Victoria Company, Canadian, crushed 20,564 tons of quartz for 2,773 oz. and paid £750 in dividends. The Tower Hill Company, working at a depth of 210 feet, crushed low-grade ore. The results obtained by prospectors on the White Horse Ranges were, for the most part, unsatisfactory.

## 1873.

In 1873, owing to the failure of many joint-stock companies in the boom of 1870 and to the introduction of the tribute system in many mines, co-operative parties again came into vogue, and worked both quartz and alluvial. The gradual decline in the output of the alluvial mines continued. The St. George and Band of Hope United Company, prospecting at shallow levels, opened up a promising reef-wash above the level of the "fourth rock." During the year this company was re-organized under the name of the St. George Company. The yield from the Kohinoor mine improved during the first half of the year, but afterwards fell away. The Hand and Band mine was worked on tribute, about 300 men being employed. Early in the year the Golden Reef Company, which had a small claim adjoining the Kohinoor, attracted much attention by the discovery of a rich reef-wash; for the quarter ending July the return was 2,782 oz., and the dividend paid during the term not only covered the whole cost of works to date, but left a substantial profit; a good average yield was kept up till the end of the year, 5,478 oz. being won in nine months. The Saint's mine was worked on tribute. Prospecting was still in progress at Winter's Freehold without any important results. The yields from the Band of Hope and Albion Consols diminished by over 35,000 oz. and the company, for the first time in its history, failed to pay any dividends. The City of Ballarat Company was engaged in the sinking of a shaft and erecting a large pumping plant.

Among the quartz mines, the New Kohinoor Company began operations on the Burra Burra line of reef. Mining at Ballarat East improved all round, and satisfactory returns were won by the Grand Duke, the Duchess, and the Parade companies at Black Hill Flat.

## 1874.

The working expenses in alluvial mines increased and the yields fell away to such an extent during 1874 that more attention was paid to the quartz reefs of Ballarat East, where the Indicator had now been recognised and the source of the rich specimens had been located. Many of the large alluvial companies were wound up; for example, the Great Gulf to the south of Sebastopol, the Bonshaw Freehold, the United Albion, and the Park Company. The Prince of Wales Company's quartz workings were flooded by water accumulating in the deserted alluvial mines. Winter's Freehold, now working terraces or reef-washes at various altitudes, gave better returns. The City of Ballarat Company had much water to contend with while sinking its shaft, and for a considerable time it pumped up to 3,000 gallons per minute without reducing the flow. The output of the Band of Hope and Albion Consols was reduced to 5,606 oz., and the yields from the Kohinoor and the Golden Reef Companies also fell away. The New Kohinoor Company produced over 1,100 oz. of gold from the Burra Burra line of reef and this led to further prospecting along the line. Deep sinking for quartz was continued by the Sovereign Company at Ballarat East, a depth of 800 feet being attained. The chief gold-producing mines were in the vicinity of the Black Hill Flat, where the Black Hill, the Parade, the Parade Extended, the Countess, and the Duchess were located. Rich specimens were obtained from the Indicator; one found by the Parade Extended Company in August weighed 153 oz. in the rough and yielded 133 oz. of gold; another found in May in the Black Hill Company's workings weighed 115 oz. and yielded 100 oz. of gold. The Sovereign Company mined large bodies of quartz and crushed 15,798 tons for 2,459 oz. The Black Hill Company won 3,437 oz. from 5,886 tons. The Queen Victoria Company's output diminished to 722 oz. from 3,592 tons, and the company soon afterwards ceased crushing. At Gum Tree Flat the Don Company maintained its usual small output and the Two Ton mine at Black Hill had a diminished yield. The Endeavour Company, working to a depth of 200 feet, paid £763 in dividends, the production being 339 oz. of gold from 1,510 tons of ore. The value of the stone mined by the Britannia diminished, 2,406 tons yielding only 372 oz., as compared with 2,320 tons for 779 oz. in 1873. The Tower Hill Company in its isolated position failed to locate any ore of better quality than in previous years and ceased work; the output for the year was 199 oz. from 1,731 tons.

For the year 1874 the general average of gold per ton of the quartz crushed was 7 dwt. 15 gr. as compared with 5 dwt. 11 gr. for the year 1873.

## 1875.

Mining operations in 1875 were marked by dullness. Alluvial mining had now entered upon the last stage of its career in Ballarat. Throughout Sebastopol the deep levels were flooded owing to the cessation of operations downstream, and work at the Hand and Band came to a stand-still on account of litigation. The future for deep-lead mining lay to the west of the city, where Winter's Freehold was still in an indifferent position, barely more than paying its way. The City of Ballarat Company was still engaged in a struggle with heavy water. An attempt to form a drainage company to deal with the alluvial water at Sebastopol did not prove successful. The production of gold by the Band of Hope and Albion Consols increased and the company again paid dividends after a lapse of two years.

In quartz mining there was an improvement. The most promising mine was the Sovereign, where the results from the lower levels were anxiously watched, 12,900 tons of quartz being crushed for 2,289 oz. of gold. Many of the smaller claims on the Black Hill Flat were amalgamated to form the Black Hill United. The Parade Company, though not maintaining the yield of the previous year, paid £500 in dividends.

The output of the Countess mine increased to 724 oz. from 2,153 tons. The yield from the Duchess mine was much smaller. The Don Company at Gum Tree Flat had the most successful year of its career, crushing 3,506 tons for 737 oz. The Endeavour Company maintained its usual average and paid several dividends. The Llanberris Company produced only 1,701 oz. of gold from 21,042 tons of quartz. The Britannia mine, working quartz at the shallow levels, gave better returns and paid regular dividends. The Black Hill Company crushed 5,845 tons of ore for 3,769 oz. of gold. The Black Hill South and the Black Hill South Extended crushed small parcels of ore of fair grade.

## 1876.

In 1876 alluvial mining was almost a thing of the past. The tributers at Winter's Freehold found some promising high reef wash 1½ miles from the shaft and were enabled to make a small profit during the year. After a hard struggle with the water the City of Ballarat Company's shaft was bottomed in December at a depth of 409 feet. At the Band and Albion Consols No. 2 shaft the lower levels had to be abandoned owing to the rising water, and work was confined to shallow reef-washes, which were quite dry; owing to the smaller costs of working, however, the company paid £1,112 in dividends, though the gold yield (2,425 oz.) was the lowest in the history of the mine. Among the new companies formed to work the western leads were the New City of Ballarat, an offshoot of the City of Ballarat Company, which took up the North Park ground, and the North City Company, which took up the ground abandoned by the Great North West Company; neither company lasted long.

A revival in quartz mining at Ballarat West was caused by the operations of the New Kohinoor mine on the Burra Burra line of reef. The Township reef was again tested, and some rich stone was found in the old workings. The Cemetery reef also was again worked at a profit. At Ballarat East the Indicator was now recognised from Black Hill to Canadian Gully, and the mines along its course were opening up well. In December a specimen containing 196 oz. 7 dwt. of gold was found on this line in the Parade claim. The Black Hill United Company began to open up large makes of payable stone, but the yields from the Black Hill Company decreased to 2,025 oz. from 3,768 oz. in 1875.

## 1877.

In 1877 the hope of a revival in alluvial mining and of a return to the busy scene of the sixties was centred in the City of Ballarat Company, which now attracted much attention. The shaft was opened out at a depth of 510½ feet, then the greatest depth attained by any alluvial shaft in the colony; this level, however, proved to be too shallow for working the deep ground, and the shaft had to be deepened to 561 feet before the end of the year. The gutter south of the shaft was 530 feet below the sill and dipped southwestwards. Winter's Freehold Company worked poor wash during the first half of the year; later on the mine was sold and passed into the hands of the Bank of Victoria, which won better returns than the former owners. The Egerton mines now attracted attention, and in consequence quartz mining in the Ballarat district suffered. The New Kohinoor mine maintained an output of only 230 oz. less than in the preceding year. The Band of Hope and Albion Consols Company was engaged in prospecting for quartz from No. 6 shaft, overlooking the Yarrowee Creek, near the Redan lead. At Black Hill Flat, the Parade and the Victoria United companies met with some fine specimens. The returns from the Black Hill United Company decreased, though a larger tonnage of quartz was crushed. At Canadian Gully mining showed signs of revival. The Sovereign Company abandoned its deep-sinking scheme and wound up during the year. On the White Horse Ranges Hawthorn and party had promising results. The Llanberris company crushed poor quartz, the return being 575 oz. from 7,289 tons, an average of under 2 dwt. to the ton. The Don Company, after a career of eight years, was wound up.

## 1878.

In 1878 alluvial mining in Ballarat was neglected owing to the attractions offered by the rich field in the vicinity of Allendale. The lower level of the City of Ballarat Company was worked without any encouraging prospects. Winter's Freehold, now the property of the Bank of Victoria, returned 3,296 oz. against 2,624 oz. in 1877. The Hand and Band Company, after litigation extending over several years, settled its dispute, and the property passed into the hands of the Park Extended Company. The question of the drainage of the Sebastopol plateau was again mooted and Government assistance was asked.

The Band and Albion Company continued to obtain fair returns from the tributary lead in its No. 4 shaft, and to prospect for quartz at No. 6 shaft. The returns from the New Kohinoor were not equal to those of former years, but the small co-operative parties (Smith's, Serjeant's, and Williams' Freehold) working for the continuation of the line to the south, had encouraging prospects. The Guiding Star Claim was again taken up, new machinery was erected, and rich quartz was located in the old workings. At Ballarat East the Countess had more encouraging prospects. The Parade, the Victoria United, and the Black Hill United yielded well, several rich specimens being discovered, including one of 136 oz. found in August by the Black Hill United Company. The New Sovereign Company, which had acquired the claim of the Sovereign Company, was wound up during the year. The yields from the Llanberris and the Black Hill companies were better than in the preceding year. Hawthorn and party on the White Horse Range maintained their average output. Two nuggets were reported in December; one weighing 61 oz. was found in the cement by tributers in the Rising Sun claim, and the other weighing 23 oz. was found by some Chinese at Canadian. In old ground at Eureka the New Eureka Company treated the headings and cement, at times with profitable results.

## 1879.

The year 1879 opened with no marked activity in mining. The alluvial mines at work did not fulfil expectations and were dragging along. The most attractive alluvial mining fields were now Kingston and Allendale. Later in the year, however, the tide turned and renewed interest was aroused, not only in Ballarat West, but throughout the whole district, by the discovery of rich quartz in the Band of Hope and Albion Consols Company's No. 6 shaft. Almost simultaneously rich alluvial, yielding up to 60 oz. to the machine was located in No. 4 shaft of the same company

The City of Ballarat Company was still engaged in prospecting, but without much success. The yield from Winter's Freehold increased to 3,995 oz. for the year.

In quartz mining the results from the Band and Albion led to a revival which was warranted by the value of the stone; the yield for the first eight months was 11,410 oz. Good prospects were disclosed in the smaller claims lying in the direction of the New Kohinoor. Barton and others "jumped" what was claimed to be an excess of several hundred feet along the main line of reef held by the Band of Hope and Albion Consols, and this led to litigation which occupied the attention of the court for many months. The prospects of the New Kohinoor Company improved towards the end of the year, and the lode was found to be distinct from that worked in No. 6 shaft of the Band and Albion. At Ballarat East the returns from the Endeavour, the Black Hill and the Llanberris companies improved. The Sulieman Pasha, a new venture, found gold-bearing stone. At Black Hill Flat, the Queen Company worked better ore and paid small dividends. With the rich returns from Ballarat West, the Eastern field was neglected.

## 1880.

In 1880 the deep alluvial mines claimed but little attention owing to the boom in quartz claims at Redan, and also to the discovery of reef-wash at the Hurdsfield rush. Winter's Freehold closed down early in the year, leaving the City of Ballarat the only deep-lead mine at work in the district; the results from this mine were far from satisfactory, the gutter proving irregular in width and of low value. The Hurdsfield rush was the result of the discovery of an unworked area of reef-wash between the Malakoff and Milkmaid leads in the vicinity of Raglan and South streets; and a number of claims were pegged out to work various town allotments. Houses were removed in order to provide space, and a large number of men were employed on these small holdings to prevent adjacent claim-holders from encroaching on some of the blocks. As many as 100 men were engaged by companies holding less than a quarter of an acre. The boom collapsed as suddenly as it began, and by the end of the year the locality had almost resumed its normal aspect, only a couple of the claims being at work. From this rush 16,000 oz. of gold was won from eight claims and, although the unwarranted flotation of worthless companies had an injurious effect on local mining, the results were, on the whole, not altogether valueless.

Among the quartz mines, pride of place fell easily to the Band of Hope and Albion Consols, where the output amounted to 18,770 oz. from 27,471 tons of quartz from a depth of 430 feet in No. 7 shaft. The revival in the previous year had a beneficial effect, adjoining companies now paying dividends, and over a score producing gold; among the former were the Young Band and Albion, the Band of Hope Quartz, the No. 2 Band of Hope, Williams' Freehold, the New Burra Burra, the Washington Freehold, the New Kohinoor, and the No. 2 New Kohinoor. The principal mines on gold and prospecting were the New Crescent, the Band and Barton Consols, the No. 1 Band and Barton, Serjeant's Freehold, and Smith's Freehold. Among the smaller claims Benn's, Jones', Hawthorne's, Wareham's and the East Kohinoor were prominent. The North Kohinoor Company, formed to work a quartz reef supposed to exist in the alluvial workings of the Great Eastern Company, cleaned out the old shaft and erected machinery. North along the Township line the Collis Washington Company opened up large bodies of stone, which was regarded as about payable. The Guiding Star Company (orginally the St. George) worked a reef averaging 12 dwt. to 15 dwt. of gold per ton to the water level of the alluvial. This company, however, was unable to cope with the water, and the mine closed down; the area was later secured by the Star of the East Company. With the object of striking the continuation of the Guiding Star line of lode, the Band and Albion Consols Company began to sink its No. 9 shaft during the year. In the vicinity of the show-yards, the Wendouree Company disclosed a quartz formation which yielded 13 dwt. to the ton, and led to a revival in prospecting in that neighbourhood. The rich yields from the Band and Albion group of mines caused the mines of Ballarat East, which worked low-grade ore, to be almost entirely deserted, and the capital requisite for prospecting was withdrawn from the eastern portion of the field. The Queen Company at Black Hill Flat still obtained good specimens; the largest was found towards the end of the year at a depth of 480 feet, and yielded 225 oz. of gold. The Llanberris Company continued to treat a large quantity of low-grade stone, 10,812 tons being crushed for a little over 1,000 oz. The average quality of the ore mined by the Black Hill Company improved, 12,110 tons yielding 6,511 oz. The returns from the Parade and the Duchess companies were small. Prospecting at the Victoria United, the Sulieman, and the Britannia companies was continued, with but little success. The yield of the Endeavour Company decreased, and the mine was closed down after a career of 27 years. Prospecting on the White Horse Ranges was carried on with small returns, the chief objective being the Indicator belt of country. The following claims were situated in the country south of the Prince Regent, and were worked principally by co-operative parties:—The Corn Exchange, Clarke's Freehold, and Russell and party were at work on the Promised Land line of lode, with yields as high as 2 oz. to the ton. The Mazeppa Company was working veins on the Indicator at a depth of 102 feet and getting up to 5 oz. per ton. The Star of the West at 100 feet got rich specimens from the Indicator. Murray's, the Taunton, the Bonnie Jean, and the Annie Laurie were each about 100 feet in depth. The Twin Birthday, formerly known as the Golden Gate Company, was engaged in cleaning out the old shaft and found a "specimen" weighing 7 lb. at the 30-ft. level. Johnson and party and Serjeant and party worked at about 90 feet, and the latter party had rich returns from two veins. The Dalzell and Buchanan Company took over the old Mt. Clear claim and sank the shaft to 200 feet as the formations had been worked out to water-level (160 feet). Morris and North, the General Roberts (at 320 feet), and the Zulu Chief and Five Ton Company were prospecting at the southern end of the Indicator belt.

## 1881.

In 1881 the number of miners (3,086) engaged in the Central Division of the Ballarat district was the largest since 1874. The shrinkage in the number of miners was conspicuous during the years 1871 to 1874, when the alluvial mines were closing down. The gold output in 1881 reached 110,226 oz., the largest yield, with the exception of that for 1880 (123,889 oz.), during the previous ten years. The amount paid in dividends

was also considerably increased; in 1874, the worst year on record, £12,222 was paid; in 1880, £142,713; and in 1881, £94,416.

The City of Ballarat Company continued to prospect, but met with little success; occasionally the prospects were good, but the wash-dirt proved very irregular and the gold won during the year amounted only to 100 oz. The North Hurdsfield, the longest-lived of the Hurdsfield group, continued during the early part of the year and won 800 oz. of gold; it was worked chiefly by tributers, who made good wages.

In quartz mining at Ballarat West, the only producing claims lay between the New Kohinoor and the Band of Hope and Albion Consols No. 6 shaft. Of this group, the Band and Albion held the best position, the year's return being 22,673 oz., the largest output to date from any quartz claim in the district; dividends amounted to nearly £43,000. Work was carried on at three shafts, Nos. 4, 6, and 7, during the whole year, and at No. 9 for the greater portion of the time. At No. 9 shaft, the Guiding Star lode was tested at the 300-ft. level, but as it proved poor, work ceased and the company began to sink No. 10 shaft on the Consols line of lode. Dividends were paid by the New Kohinoor (£6,000), the Washington Freehold (£5,700), the Young Band Extended (£2,400), and the North Band companies (£1,800). Other mines, including Smith's Freehold, Serjeant's Freehold, the New Crescent, the Young Band and Albion met with varying success. The Band and Barton Company discovered large bodies of low-grade quartz. The Band of Hope Quartz Company, after a highly successful career during three years, began to give decreased returns.

At Ballarat East, the Queen, the Black Hill, and the Black Hill United companies continued to open up well, but the yields from the first two mines decreased by over 2,000 oz. The Parade Company improved slightly, and the Victoria United produced high grade ore from narrow veins in the vicinity of the Indicator. The Duchess Company ceased operations. The Sulieman Pasha Company, which had been assisted by a Government grant, was fortunate in the location of payable stone, and was enabled to repay the whole of the loan. On the southern portion of the field Tinworth and party worked with fair success veins associated with the Indicator. Messrs. Pearce Bros. at Canadian were engaged in shaft-sinking and in prospecting on their claim, which was formerly known as the Queen Victoria.

## 1882.

In 1882 alluvial mining was almost neglected. The City of Ballarat Company attracted but little notice; the workings were in the vicinity of the abandoned Durham gutter, and the prospects were not encouraging; the gold output for the year, about 1,000 oz., did not cover expenses. At Redan, the quartz companies having reached a depth beyond which small claims were no longer profitable, began to amalgamate. Of the dividend-paying mines the Band and Albion headed the list with, £35,530 from 46,841 tons, the largest crushing to date, but the gold yield fell off to 20,733 oz. The New Kohinoor and the Young Band Extended companies also paid dividends of £11,400 and £14,400 respectively. The Star of the East and Owen's Freehold companies continued to prospect for the extension of the Consols line of lode to the south, and the North Kohinoor for the northern extension, but without success. At Ballarat East a period of depression was experienced. The Black Hill Company had a more successful year, obtaining nearly 5,000 oz. of gold from 12,525 tons of quartz. The Queen Company's mine, whose workings had reached a depth of 660 feet, was worked chiefly by tributers, the veins at levels above 500 feet providing quartz which averaged about 6 dwt. to the ton. The tonnage of ore and the output of gold decreased in the Victoria United, the Britannia, the Parade, the Llanberris, and the Sulieman Pasha mines. The Last Chance Tribute Company was formed, and acquired the claim of the Endeavour Company. The Black Hill United Company crushed less quartz for a reduced yield, the larger makes of stone being now worked out and prospecting failing to reveal new makes.

## 1883.

The year 1883 was marked by a general depression in mining both at Ballarat West and at Ballarat East. Calls exceeded dividends. Many mines closed, and miners were forced to leave the field. The City of Ballarat Company, the last of the alluvial mines, stopped work, after an unsuccessful career. The ore treated by the Band and Albion Company, which had occupied a leading position during the previous three years, fell away both in quantity and quality, averaging, with pyrites, under 8 dwt. of gold to the ton. Prospecting operations were continued by the North Band and Barton Company at a depth of 800 feet, and by the Star of the East, Owen's Freehold, and the New Band and Albion Consols without leading to any discovery of importance. The New Kohinoor Company found its returns unprofitable and ceased crushing.

At Ballarat East the prospects were not good. No new discoveries were made. The Black Hill Company was now getting poorer results. The Queen Company ceased operations, and the ground passed into the hands of the Black Hill Company. The Parade, the United Black Hill, and the Victoria United Companies had very small yields. The Britannia improved, but the Llanberris had about the poorest results since the inception of the company. The Sulieman Pasha's returns were better than those of the preceding years. At the Last Chance mine (fomerly known as the Endeavour) the tributers were erecting machinery. Along the White Horse Ranges signs of a revival were evident. When Messers. Pearce Bros. had reduced the water-level by their operations at Canadian Gully, a number of co-operative parties worked the ground; among these Clarke, Tinworth, and Ah Yuck were successful in locating rich viens. Some of the claims held by these parties were floated into companies, the best known being the North Woah Hawp, the Woah Hawp Canton, and the Prince Regent.

## 1884.

In 1884 the Ballarat East mines improved, and at the western field a much more healthy condition of mining prevailed. The Band and Albion Company yielded 16,000 oz. and paid £22,450 in dividends. Work at No. 9 shaft (abandoned two years before) was resumed to test the Guiding Star lode further. The shafts on the Conso's lode (Nos. 7 and 10) had reached a depth of 745 feet and 1,000 feet respectively. Sinking was resumed by the Band of Hope and the New Kohinoor companies. The North Band and Barton still had poor prospects. The Sir Henry Loch Company prepared for vigorous development. Serjeant's Freehold Company was successful in locating rich veins.

At Ballarat East a revival took place. The yield from the Llanberris, though still poor, was double that of the preceding year. The Black Hill Company continued on the down grade; operations were confined to about the 500-ft. level. The Victoria United, the United Black Hill, the Parade, and the Britannia each improved, and the Sulieman Pasha, while working to a depth of 450 feet on the Danish line of reef, kept up the preceding year's average. Tributers in the Last Chance met with success above the 335-ft. level. In the vicinity of Canadian Gully the North Woah Hawp Company, formed during 1883, found payable ore and paid £1,650 in dividends on a called-up capital of £1,750; the yield was 2,459 oz. from 2,774 tons. The Normanby Company, formed in July, sank a shaft 260 feet deep to prove the northern continuation of the North Woah Hawp veins, while southwards the Woah Hawp Canton, Tinworth's, the Prince Regent, and others were at work on the Indicator line of country with encouraging prospects.

## 1885.

In 1885, although the Band and Albion Consols still kept up a good output, the adjacent mines failed to locate payable ore, and mining activities were lessened in the vicinity of Redan. The yield from the Band and Albion mine amounted to 15,286 oz., and the dividends to £31,430. The workings of the mine had now reached a depth of 1,090 feet in No. 10 shaft, and good stone had been opened up at this level. The activities of the Band of Hope and of Serjeant's Freehold companies were confined to work by tributers on low-grade quartz, the former company paying one small dividend. The Sir Henry Loch Company continued shaft-sinking. The North Band and Barton Company prospected without any very promising results, and the New Kohinoor drove on the Consols lode at 910 feet without locating gold-bearing quartz. The Star of the East continued prospecting operations, the shaft being 920 feet in depth; at 660 feet a cross-cut was put out to intersect the Guiding Star line of lode, which had been proved in the alluvial workings.

At Ballarat East, the Parade and the Victoria United companies continued to improve, the Parade mine being worked by tributers for an output of 464 oz., making the total value of the yield from this mine to date £64,786. The ore from the Britannia and the United Black Hill companies fell off considerably in value, but that from the Llanberris and Sulieman Pasha Companies improved. The Sulieman Pasha Company began to sink a new shaft (No. 2 during the year. The Black Hill yields continued to decline, although the quality of the stone crushed was up to the average of the preceding year. The yield from the North Woah Hawp Company was less than in 1884, although nearly twice as much quartz was crushed. The Normanby Company continued prospecting operations. The Speedwell Company had a poor return. The Last Chance tribute party, working at a depth of 340 feet, won 1,252 oz. of gold from 5,383 tons crushed.

## 1886.

In 1886 the discovery of rich ore on the Guiding Star line by the Star of the East Company led to a boom which exceeded that consequent on the striking of the rich stone by the Band of Hope and Albion Consols in 1879. The steep southerly pitch of the Consols line of reef worked by the Band and Albion Company carried it into the Star of the East claim, so that this claim was proved to be enriched at two points. To work the Guiding Star reef a second shaft was begun, and meanwhile the sinking of the main shaft for the Consols lode was undertaken. Among the companies projected to work the continuation of the Guiding Star lode, the South Star, the Central Plateau, and the Sebastopol Plateau companies began shaft-sinking. Morgan's Freehold Company, after endeavouring to locate the Consols lode, carried out operations on the high reef-washes, but was unsuccessful. The yield from the Band of Hope and Albion Consols declined to 4,166 oz., but £4,490 was paid in dividends, and operations were resumed at No. 9 shaft, where the water-level stood at 135 feet from the surface; the sinking of another shaft (No. 11) was also began near Pleasant-street to prove the extension of the Albion line of reef. In Serjeant's Freehold mine the ore won by tributers at the 340-ft. level averaged less than 5 dwt. to the ton. The North Band and Barton Company was not successful at the lower levels, and continued to prospect at a shallow depth. The New Kohinoor also abandoned the deeper levels and continued prospecting in the vicinity of the workings at 400 feet.

At Ballarat East vigorous prospecting was carried out. The Sulieman Pasha Company was engaged in sinking its No. 2 shaft, and during the year reached 400 feet; the gold yield of this company was better, although a smaller tonnage of quartz was raised. The Britannia amalgamated with the Major Company, and formed the Britannia United Company. Some rich quartz was won by the Major Company prior to the amalgamation. The quartz opened up by the Last Chance Tribute Company continued poor except in the Indicator veins, where it was payable. The Llanberris Company steadily improved its position. At 400 feet it worked the Western lode, which was 12 feet thick and payable. Several tribute parties were engaged working the area. The Red Streak shaft was re-opened and sinking was resumed. The yield of the Speedwell Company substantially improved during the latter part of the year. The North Woah Hawp and the New Normanby were engaged in shaft-sinking and in working veins on the Indicator. The Woah Hawp Canton Company crushed a large body of stone averaging 5 dwt. per ton. The return from the Prince Regent averaged almost 1 oz. per ton. To the south of the Prince Regent the Glasgow Company worked the ground formerly held by the Mazeppa Company. Further south the Dalzell and Buchanan Company mined a large lode with payable results. At Little's claim, still further south a formation 28 feet wide was worked at a profit. On the same line Lester and party and Donovan and party continued to raise payable quartz, and Hawthorn and Company to the west of the Indicator line maintained their usual average.

## 1887.

In 1887 mining at Sebastopol continued briskly throughout the year, and a portion of the field that had been deserted after the alluvial mines closed down again enjoyed prosperity. The Star of the East Company's No 1 shaft reached a depth of 1,270 feet, and No. 2 shaft was sunk to 720 feet after the difficulties incidental to passing through a considerable thickness of drift had been overcome. Operations on the Guiding Star line of lode were confined to winze-working below the

660-ft. level of No. 1 shaft. The Band of Hope and Albion Consols Company had now sunk No. 7 shaft to a depth of 1,415 feet. A cross-cut put out west of the Consols line cut a parallel western formation which was called the Christmas line. The Consols reef provided over 16,000 tons of quartz, which yielded 15,668 oz. of gold, and dividends amounting to £25,256 were paid. Little headway was made by the Central Plateau Company, but the South Star, after losing its first shaft by striking an old alluvial drive, began a new shaft (No. 2), and sunk this to a depth of 500 feet in seven months. Stimulated by the yields from the Guiding Star lode, the No. 9 shaft of the Band and Albion Company was deepened to nearly 900 feet, while the lode was driven on at the 400-ft and 500-ft. levels. At the 600-ft. level a westerly cross-cut was begun for the purpose of cutting the Prince of Wales line of reef. The Northern Star Company, formed during 1886, commenced the sinking of a second shaft early in the year, and reached a depth of 500 feet, where the Guiding Star lode was intersected in the eastern cross-cut, but proved to be small, and shaft-sinking was resumed. At the New Kohinoor, a cross-cut west was put out from the Consols line to cut the Guiding Star reef while the former line was being prospected at the 600-ft. and 700-ft. levels.

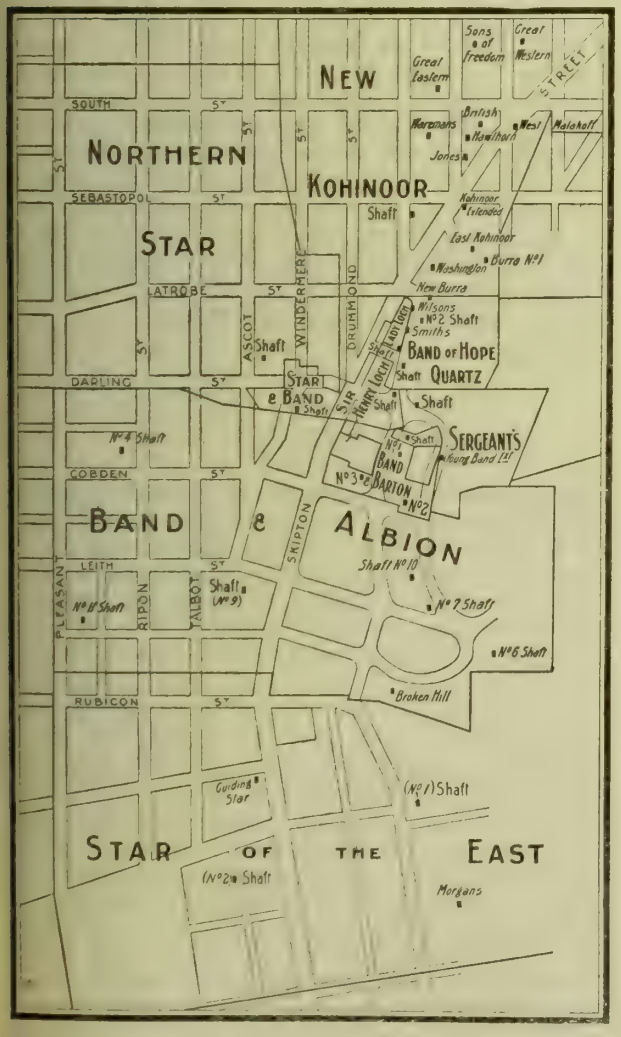



Fig. 12. Leases and position of shafts. Ballarat West, in 1887. Scale: 24 chains to 1 inch.

At Ballarat East the yields from the Britannia and the Llanberris Companies' mines generally improved. The Sulieman Pasha Company struck quartz carrying 2 oz. to 3 oz. of gold per ton at 400 feet, both in No. 1 and in No. 2 shafts, and this resulted in a boom unparalleled in the history of Ballarat East. The United Black Hill

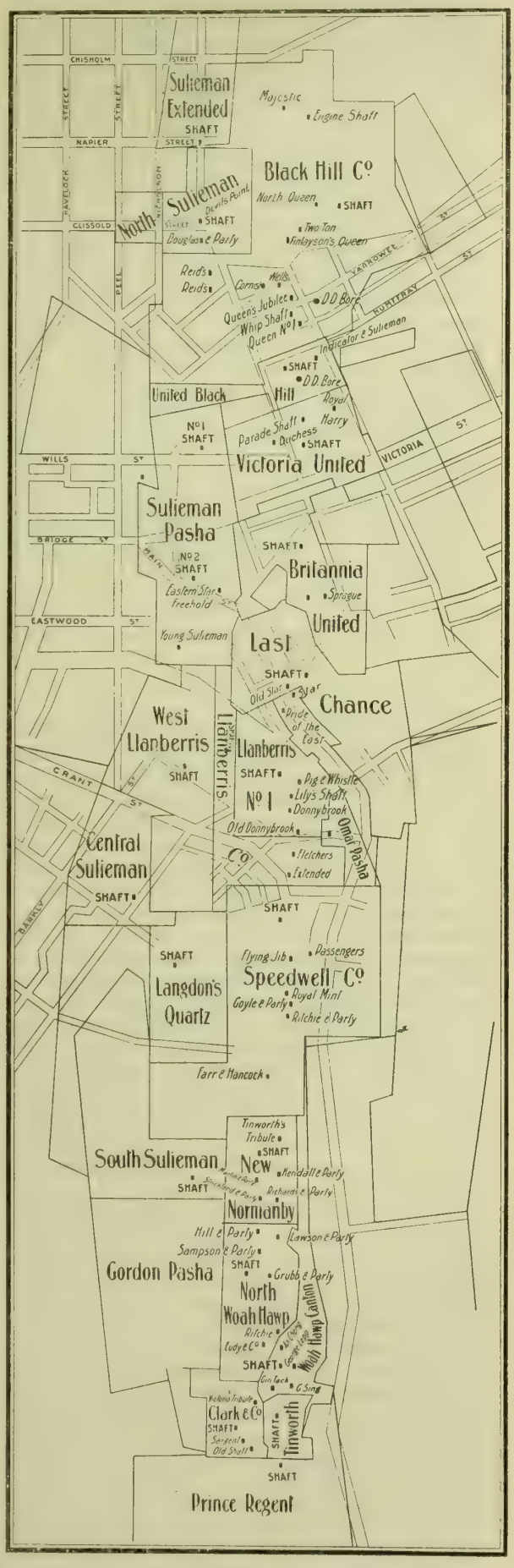



Fig. 13. Leases and position of shafts, Ballarat East, in 1887. Scale: 24 chains to 1 inch.

Company wound up after a life of twelve years, during the last four of which the quartz was poor, and was worked chiefly by tributers. The ground was then acquired by the Indicator and Sulieman Company. Southwards on the Indicator line the North Woah Hawp struck some rich veins. The New Normanby Company prospected to a depth of 600 feet, but was unable as yet to locate payable stone. The smaller claims in this vicinity the Prince Regent, the Woah Hawp Canton, Clarke's, and Tinworth's, paid their way. The Llanberris nearly doubled its output, 2,780 oz. in 1887 against 1,445 oz. in 1886. The Speedwell maintained the gold output of the preceding year, but crushed a larger quantity of stone. In the neighbourhood of the Llanberris, a number of small claims were at work; one of them, the Llanberris No. 1 Company, formed in August, began to sink the old Red Streak shaft. The Western Llanberris and the Sulieman Consols companies were also shaft sinking, while the North Llanberris awaited developments in the Last Chance Tribute claim. The yield from the Last Chance Tribute claim was greatly reduced, partly on account of the smaller quantity of stone crushed while shaft-sinking was being carried out. On the White Horse Ranges Hawthorn and party won 573 oz. from 1,710 tons, the best return during their ten years' operations.

## 1888.

The year 1888 was marked by a policy of vigorous prospecting in the mines at Sebastopol, but, unfortunately, little success attended these efforts. At the Band of Hope and Albion Consols several hundred feet of driving along the Christmas line of lode failed to locate anything payable. East of the Consols lode a formation called the Jubilee lode was located, but a trial crushing proved unpayable. On the Consols lode the payable shoot was worked to the Star of the East Company's boundary, only a few small blocks remaining. At No. 9 shaft the Guiding Star lode was prospected at a depth of 1,010 feet, and proved rich in pyrites, but poor in gold. The high average return, 11,763 oz. from 14,738 tons, was obtained from crushing small blocks of rich stone left in the old stopes at Nos. 7 and 10 shafts. In the Star of the East mine, operations at No. 1 and No. 2 shafts were in progress. At No. 1 shaft a lode discovered in 1887, and known as the Sunbeam, proved unpayable and prospecting was suspended. Near the northern boundary of the claim the Consols lode was worked from the No. 1 shaft, which reached a depth of 1,500 feet during the year. The workings on the Guiding Star lode from No. 2 shaft were connected with the workings from No. 1 to facilitate getting out the quartz. The North Band and Barton Company continued to prospect along the Consols lode with little success. The Sir Henry Loch, at the 1,093-ft. level, opened up a fine body of quartz, which gave fair returns. The New Kohinoor Company continued its prospecting drives without any marked change. The Northern Star Company was not yet successful in locating payable stone, although a well-defined lode was being tested at the 500-ft., 600-ft., and 700-ft. levels. The Central Plateau Company was still engaged in shaft sinking through basalt and drifts, and experienced much difficulty with water. The South Star, the Sebastopol Star, the South Plateau, and the Prince of Wales and Bonshaw companies vigorously continued shaft sinking and prospecting. The Lady Loch, the Don, and the Morning Star companies were formed, and operations were begun.

At Ballarat East the mines, more especially at the southern end of the field, gave much improved results. The North Woah Hawp Company opened up large bodies of good quartz to a depth of 570 feet, and the tributers did well in the shallow levels. The New Normanby Company, whose shaft on the Indicator line was nearly 700 feet deep, won a small quantity of payable stone during the year. The Llanberris Company raised less quartz and produced less gold than during the previous year. The Britannia United Company, after a year's dead work in cutting down the shaft, &c., won 3,579 oz. for the year. The yields from the Speedwell and the Black Hill Companies fell away. The Last Chance Tribute Company worked a formation known as Meanowski's lode, which averaged nearly 7 dwt. to the ton. The Sulieman Pasha produced less gold from a larger quantity of stone crushed. Operations at No. 2 shaft were not yet successful in locating payable stone, and the profits from the No. 1 shaft were required to carry on these workings. The Young Sulieman Company had sunk its shaft to 500 feet and opened out for the continuation of the Sulieman lode. The Prince Regent Company, whose shaft (776 feet) was the deepest on the Indicator line, was engaged in prospecting near the large cross-course, and in driving north. Tinworth's and the Woah Hawp Canton Companies got rich stone from the Indicator line. South of the large cross-course the South Prince Regent Company was prospecting at a depth of 450 feet.

## 1889.

During 1889 prospecting in the mines at Sebastopol continued, but without success, except in the Band of Hope and Albion Consols, the Sir Henry Loch, and the Star of the East, which were already on gold. The Band of Hope and Albion Consols Company, having sunk No. 7 shaft to 1,620 feet, prospected the Consols and Jubilee lodes at that depth. Other portions of the mine were let on tribute. No. 9 shaft, now 1,220 feet deep, was deepened to test the Consols lode at lower levels. A cross-cut west towards the Prince of Wales lode at the 600-ft. level was extended to 1,350 feet from the shaft without locating anything payable. The Sir Henry Loch Company won over 8,000 oz. for the year; the auriferous quartz extended into the New Kohinoor lease, and arrangements were made by that company to extend the Sir Henry Loch drives so as to work the stone while the New Kohinoor shaft was being deepened. The Star of the East Company was now in a highly satisfactory position, good payable stone being won from both shafts. The output for the year was 26,056 tons for 23,028 oz. The South Star, the Sebastopol Star, the Central Plateau, the South Plateau, the Prince of Wales and Bonshaw, and the Northern Star Companies continued prospecting and development without, so far, meeting with any encouraging results.

At Ballarat East a healthy state of mining prevailed. The Black Hill, the Speedwell, the Britannia United, and the Last Chance Companies all doubled their outputs. A slight falling off was noticeable in the case of the Woah Hawp Canton, the Llanberris, and the Sulieman Pasha Companies, but the yields were above the average for the preceding five years. At both the Britannia United and the Sulieman Pasha mines large bodies of quartz were opened up; in the former claim those on the Pug lode ranged from 30 feet to 60 feet wide. The North Woah Hawp Company carried out productive work at three shafts and prospecting at a fourth. The Prince Regent Company abandoned its lower levels to continue prospecting at the 330-ft. level. Prospects at the New Normanby improved, but, so far, the results from the Indicator were poor. The Indicator and Sulieman Company extended a cross-cut for the Sulieman lode, but were not successful. A new venture, called the South Britannia, was formed to rework the alluvial and cement on the old Eureka lead. The Dalzell and Buchanan Company, at the southern end of the line, met with success, and began crushing; this caused a revival to take place in this part of the field.

## 1890.

In 1890 the prosperous state of the Star of the East mine, together with the former rich yields from the Band of Hope and Albion Consols, infused renewed vigour into quartz mining at Sebastopol. Unsuccessful at shallow levels, the aim of the companies was to gain depth. The Band of Hope and Albion Consols Company worked only at the 1,600-ft. level in the No. 7 shaft, and concentrated most of its efforts on opening up the Guiding Star lode from No. 9 shaft at 1,310 feet; this reef was highly mineralized, but not payable. In the upper levels of the same mine a shoot of payable but narrow quartz was worked; but the yield for the year (under 1,800 oz.) was the smallest since the formation of the company. The Star of the East Company now held pride of place as a gold producer, with 28,168 oz. from 39,836 tons crushed, and paid £46,800 in dividends. At the 1,000-ft. level in No. 2 shaft the Guiding Star lode was 25 feet wide and gold-bearing throughout. At the No. 1 shaft, the Consols lode, though small, was highly payable. Midway between the Band and Albion No. 7 shaft and the Star of the East No. 1 shaft, on the northern bank of the Redan Creek, a party of tributers (the Broken Hill party) located a rich shoot at a depth of 170 feet, and crushed 1,093 tons for 1,059 oz. of gold. Workings on the Consols line were now sufficiently advanced to enable the position of the auriferous shoots to be well established; an upper shoot pitched north, and a lower shoot south (*see* Pl. VIIIa). The South Star Company was engaged in prospecting at the 720-ft. and 1,400-ft. levels, the Central Plateau Company at the 860-ft. level, and the Northern Star Company at the 900-ft. and the 1,000-ft. levels. At the 1,200-ft. level, Gay's Band of Hope Company was testing a lode supposed to be the continuation of the Consols lode (*see* Fig. 26, p. 134). Owen's Band of Hope, the South Plateau, and the Crown Star Companies were also engaged in unremunerative work.

Ballarat East, though productive, lacked the spirit of enterprise that pervaded the western field, and, notwithstanding the prospects and the cheap and easy means of working, only a few new companies were formed during the year. The Black Hill Company doubled its output and yield. The Britannia United Company continued to open up large bodies of payable quartz down to 550 feet. The lode at 630 feet, the lowest level, was disturbed by a fault. The yield was 7,511 oz. from an output exceeding 25,000 tons. At the Sulieman Pasha a slight shrinkage in tonnage and yield continued. At both the Llanberris and the Speedwell mines increased yields resulted from increased tonnage. The Last Chance Tribute Company operated on bodies of quartz up to 40 feet wide, and crushed over 7,000 tons for the year. The Llanberris No. 1 Company sank its shaft to 630 feet. The North Woah Hawp and the New Normanby Companies had payable results, the latter company working a large reef in the western slates. The Prince Regent Company continued to prospect in the shallow levels, and treated over 11,000 tons, averaging under 5 dwt. to the ton. The Dalzell-cum-Prince Regent Company, which mined large bodies of low-grade ore, yielded to date 3,580 oz. from 9,600 tons, and paid £5,850 in dividends. The Sulieman Consols and the South Britannia were both unsuccessful. Among the newly-formed companies the Jeweller's Reef, the South Dalzell, and the Golden Gate were prominent. The Dalzell and Buchanan Company, working to a depth of 400 feet, had a smaller return from a larger tonnage, the figures being 3,338 oz. from 5,700 tons in 1889, and 2,430 oz. from 6,600 tons in 1890. The Tower Hill Company, after a period of suspension, resumed work, and met with promising veins at 270 feet.

## 1891.

The year 1891 began with favorable prospects for the mines of Ballarat West. In the previous year the gold yield from the district was estimated at about 220,000 oz., and the dividends at £237,000. The chief local contributor was the Star of the East, with £46,000, the balance being largely from the alluvial mines at Allendale and the quartz mines at Egerton. Ballarat alone produced 92,013 oz., and the dividends paid amounted to £112,850.

During 1891 the Star of the East Company won 37,535 oz., valued at £144,014, and paid £79,200 in dividends, taking the foremost place among the dividend-paying mines of the colony. The stone crushed yielded 16 dwt. of gold to the ton, against 18 dwt. for the preceding year. Throughout the year operations were continued at No. 1 shaft on the Consols lode, where the 1,620-ft. level was opened out and stoping was begun. The stopes in the northern end of the 1,520-ft. level were exhausted, and the most southerly portion of the shoot attracted attention. At the 1,720-ft. level the lode was proved payable where intersected in the cross-cut, and driving south was begun. At the No. 2 shaft the Guiding Star lode was mined; the shaft was sunk to a depth of 1,422 feet, and various cross-cuts were opened, but the deepest workings on the

lode were at 1,100 feet, where the lode was worked to a width of 40 feet with an untested formation on the western limit of the stopes. A new shaft (No. 3) was sunk 82 feet, but was closed down on account of trouble with water. No. 4 shaft, on the Consols line, met with an extension of the rich quartz worked by the Broken Hill tribute party; at a depth of 110 feet the quartz was over 20 feet wide, and was driven on south for 150 feet, the yield from 154 tons being 237 oz. At this date the mine employees numbered 379, of whom 338 were at work in or around the mine, and 41 at the battery. The plant at No. 1 shaft consisted of one double 24-in. cylinder winding engine and gear, one 15 horse-power engine for sinking, one 12 horse-power engine working a No. 4 Root's blower, six Cornish flue boilers, one 20-head and one 60-head battery, and twenty-four Frue vanners. At No. 2 shaft, one double 22-in. cylinder winding engine and gear, one 8 horse-power sinking engine, and three Cornish flue boilers. At Gay's Band of Hope United a small crushing proved the lode unpayable, 300 tons yielding only 43 oz. of gold.

The Sir Henry Loch Company, working its small claim to a depth of 1,400 feet, crushed 13,156 tons for 8,010 oz. of gold, valued at £33,041, and paid £14,400 in dividends. The stopes in the upper levels of the Band of Hope and Albion Consols mine were worked on tribute, the yield for the year being only 308 oz. The western cross-cut from the No. 7 shaft at the 1,600-ft. level cut the lode, which proved to be 6 inches wide, and drives north and south failed to locate any larger or richer portions. In No. 9 shaft prospecting on the Guiding Star line revealed a large, poor lode at a depth of 1,200 feet for a length of over 500 feet.

The South Star Company was re-organized at the beginning of the year. The main shaft was sunk to 1,720 feet and then stopped, while cross-cuts at 720 feet and 1,400 feet were driven. At the 720-ft. level a drive north along an east-dipping lode at 1,241 feet from the shaft did not locate anything of value, and the 1,400-ft. cross-cut was extended to 1,559 feet without success. At the Central Plateau prospecting was carried on at the 860-ft. and 980-ft. levels, the shaft being now 1,015 feet deep. The Northern Star Company found nothing payable on the Guiding Star lode; the workings were 1,000 feet in depth.

At the New Kohinoor Company's mine cross-cutting at the 1,080-ft. and 1,281-ft. levels was in progress. At the 1,080-ft. level the Consols line of reef was cut and driven on for over 600 feet, but without success. Payable ore was worked in the 1,181-ft. and 1,291-ft. levels from the Sir Henry Loch shaft in this lease, but the stopes at the 1,181-ft. level were exhausted by the end of the year, and the lode in the 1,291-ft. level was small. The return for 1891 was good, though smaller than for 1890; 8,891 tons yielded 2,745 oz. of gold in 1891, and 8,100 tons 3,162 oz. in the previous year. Early in the year a small patch of good ore was found on the Guiding Star line, but it was very short, and drives several hundred feet in length proved nothing except an unpayable reef from a few inches to a foot wide.

The North Band and Barton located a few blocks of payable stone of limited extent. The Band of Hope yields for the year were low, the payable ground being nearly exhausted.

At Ballarat East several new companies were formed to work the Indicator belt. The yields from several of the old-established mines improved, but others had a downward tendency. The chief gold producer was the Britannia, with 7,598 oz., followed by the Sulieman Pasha, with 7,121 oz. from 18,865 tons crushed. The workings on the Sulieman line of lode extended to a depth of 550 feet. The Last Chance United prospected at 600 feet on the parallel lode to the east (the Pug line), and opened up bodies of payable quartz over 20 feet wide at the 500-ft. level; the upper levels were still productive; the return exceeded 4,800 oz., and £3,500 was paid in dividends. The Llanberris Company's yield was 4,316 oz., the highest during its career of nearly thirty years. The New Speedwell Company produced 2,000 tons of quartz more, but 200 oz. of gold less, than during 1890. The New Normanby Company was on the up grade, a good make of stone being opened up at the 800-ft. level, while the 700-ft. level yielded fair stone, and the 600-ft. level stone of high grade. The returns for the year was 2,681 oz. from 7,550 tons. The tonnage and gold yield from the North Woah Hawp mine diminished. In this mine large bodies of quartz of variable quality were stoped to a depth of 600 feet on the Indicator and western slates, while prospecting was being carried on from the shallow Nos. 3 and 4 shafts. The North Prince Extended Company, prospecting east of the shaft, located a payable shoot. Small crushings were treated by the Prince Regent, the North Prince Regent, and the Sulieman Consols, and larger returns were won from the Dalzell-cum-Prince Regent and the Dalzell and Buchanan mines. The South Woah Hawp Company worked at a depth of 400 feet on the south side of the Prince Regent cross-course, and obtained a 44-oz. nugget from a vein on the Indicator above this level. At the southern end of the field a newly-formed company, the British Queen, began cross-cutting at a depth of 400 feet. In the neighbourhood of the Sulieman Pasha, the Eastern Star Freehold mined high-grade stone at a shallow level on the eastern side of Main-street. The Britannia United treated 25,379 tons, the largest yearly output since the inception of the company, for 7,599 oz., a yield exceeded only in 1889; the amount crushed in 1890 was 25,086 tons. The Black Hill Company's yields fell off, owing to the exhaustion of the veins at shallow levels. The South Britannia Company was engaged in re-working the old alluvial ground on the Eureka lead, and struck some cement, which was treated at a profit.

The year throughout was the most prosperous for the preceding decade. From the Central Division alone (the area included within the present survey) dividends amounted to £112,800, and the gold yield to 102,848 oz., of which 2,500 oz. was from alluvial and cement. The average number of miners employed (2,895) was also a maximum. The average yield of gold from the 225,000 tons crushed in the Central Division was 8½ dwt. The large quantity of high-grade ore treated by the Star of the East Company had an appreciable effect on the general average.

## 1892.

Throughout 1892 there was but little change in the mines at Ballarat West. The largest producer was still the Star of the East, but the output of gold and dividends decreased, as shown in the following table:—

| Year. | Yield. | Ore Crushed. | Gold per Ton. | Dividends. |
|---|---|---|---|---|
| | ozs. | tons. | dwt. gr. | £ |
| 1890 .. | 28,168 | 39,836 | 14 3 | 46,800 |
| 1891 .. | 37,535 | 46,865 | 16 0 | 79,200 |
| 1892 .. | 32,640 | 49,228 | 13 6 | 52,800 |

The total gold yield from this mine to the end of the year was valued at over £500,000, and the total dividends amounted to £223,200 on a called-up capital expenditure of £12,200. Operations on the Consols lode reached a depth of 1,720 feet, and a cross-cut was in progress at a lower level. At the 1,720-ft. level the lode gave no signs of diminishing in size or value; at the 1,620-ft. level the south drive was also in a lode from 3 feet to 4 feet wide, carrying good values; but to the north at this depth the stone was poor, and came from below the south-pitching shoot. On the Guiding Star lode at No. 2 shaft, the chief producing stopes were at the 1,000-ft. and 1,100-ft. levels north of the shaft, where a body of quartz from 50 feet to 70 feet wide was mined at a face. South of the shaft the stone was narrower but carried gold. The workings at No. 4 shaft did not prove a continuous make of quartz, and mining operations here were, in consequence, stopped during the year.

At the South Star prospecting was continued unsuccessfully, both in the vicinity of the Guiding Star line and on the Consols line, at the 1,700-ft. level. The conditions were similar at the Central Plateau, and at the Northern Star mines.

The gold yield and output of quartz from the Sir Henry Loch mine fell away. The North Band and Barton Company continued prospecting without much success. At the southern end of the field the South Plateau Company, early in the year, met with an auriferous spur in the shallow levels, but a few small crushings sufficed to exhaust the supply of quartz, and further prospecting was unrewarded. Unsuccessful prospecting was the lot of the Band and Albion Consols, both on the Guiding Star and on the Consols lodes. The New Kohinoor Company, having exhausted its payable stone, continued prospecting both on the Consols and on the Guiding Star lines, at a depth of 1,080 feet and 580 feet respectively, but, though laminated mineralized quartz was followed, nothing payable was disclosed.

At Ballarat East the outstanding feature was the diminished yield from the principal producers of 1891. The output of the Britannia Company sank to 4,565 oz. from 14,098 tons, but dividends amounting to £1,200 were paid. At a depth of 720 feet large bodies of stone were opening up, and in the upper levels an abundance of low-grade quartz was in sight. At the Sulieman Pasha a shrinkage of nearly 2,000 oz. took place, but dividends of 2s. 6d. per share were paid; the shaft was now 700 feet deep. At the Llanberris the gold yield and tonnage fell off, but better returns by the Llanberris No. 1 Company tended to compensate for this impoverishment; the latter mine yielded 547 oz. from 1,483 tons of quartz, mined at a depth of 566 feet. Yields from Dalzell and Buchanan's mine fell away considerably. A marked improvement, however, was noticeable in the Last Chance, the New Normanby, the North Woah Hawp, the New Speedwell, the Black Hill, the North Prince Regent, and the Dalzell-cum-Prince Regent mines, while new companies to enter the list of producers were the Woah Hawp Canton, the Victoria United, and the British Queen.

## 1893.

In 1893 yields from the Star of the East shrunk still further, and the other companies at Ballarat West and Sebastopol failed to locate anything payable. At the Star of the East, the lode in the workings from No. 1 shaft was becoming irregular and poor in the 1,720-ft. level, the 1,620-ft. level stopes were exhausted, and the 1,820-ft. level had not as yet located any quartz owing to the disturbances caused by a slide. At No. 2 shaft the Guiding Star lode was stoped above and below the 1,100-ft. level, a great width of quartz being mined in the northern end, where the quality was very fair. For the year, 50,165 tons yielded 25,177 oz. of gold, an average of slightly over 10 dwt. to the ton; dividends amounted to £35,000.

The Sir Henry Loch Company had now reached a depth of 1,620 feet, and the lode was opening up well. The yield was 6,394 oz. from 8,316 tons, against 5,091 oz. from 9,152 tons in 1892.

The Band and Albion Company devoted most of its attention to No. 9 shaft, where the Guiding Star line of lode was prospected, but without much promise of success. No. 7 shaft on the Consols lode was now worked by tributers, who met with poor results. A new shaft, No. 11, was sunk to test the western part of the lease; during the year it was bottomed at 174 feet on a reef-wash from which a few colours of gold were obtained.

The New Kohinoor Company succeeded in locating in a rise the continuation of the rich patch on the Guiding Star line found in 1891, but the shoot was small, and was exhausted after 308 tons had been crushed for a return of 250 oz. On the Consols line driving was continued at the 1,000-ft. and 1,200-ft. levels without success, and the 1,509-ft. level from the Sir Henry Loch was continued into this area, but nothing payable was found. In the shallow levels the flat spurs to the east of the main body of quartz in the northern part of the mine were worked, but the veins were too patchy to be remunerative, and they were abandoned.

Prospecting at the South Star, the Central Plateau, the Sebastopol Plateau No. 1, the Prince of Wales, the Prince of Wales and Bonshaw, the South Plateau, and the Northern Star was actively carried on, though with little promise of success in any of the levels, but at the North Band and Barton the results were slightly more satisfactory.

The Ballarat East mines, though not large producers, steadily continued operations, and in several instances paid good dividends, the best being the Last Chance, with £5,500 for the year. Operations at this mine had now reached a depth of 700 feet; large bodies of easily-mined quartz were opened up, and the veins from the main lode proved very rich in some places. At a depth of 500 feet the Llanberris No. 1 Company worked Indicator veins which averaged 11 dwt. per ton for the year. The yields from the Britannia United and the Black Hill mines fell away.

The New Normanby Company found rich patches on the Indicator, as well as large bodies of payable stone in the western slates. The workings were now at a depth of 800 feet. For the year 11,840 tons returned 6,137 oz., and dividends amounting to £4,200 were paid. The adjoining mine, the North Woah Hawp, had an improved yield (3,668 oz.), though the tonnage was smaller, paid £1,925 in dividends, and carried on vigorous prospecting. At the New Speedwell the yield slightly decreased, 4,673 oz. being won in 1893 against 5,156 oz. in 1892. A marked improvement took place in the yield of the Dalzell-Buchanan Company, 8,300 tons being treated for 1,650 oz. of gold. The output from the Woah Hawp Canton decreased to 1,791 oz. The Sulieman Pasha produced 5,134 oz. from 17,185 tons, slightly less than the previous year's output, but the mine remained payable. The shallow mines in the vicinity, the Eastern Star Freehold and the Eastern Star Extended, had good returns and paid numerous dividends.

## 1894.

In 1894, the principal event at Sebastopol was the discovery of an auriferous shoot on the Guiding Star lode by the South Star Company, and the consequent employment of a large number of miners. The payable quartz was first located below the 720-ft. level, but soon afterwards it was found in the level and was driven on north and south. At the 1400-ft. level prospecting was unsuccessful, and a rise was put up to intersect the reef proved above. The Star of the East maintained a regular output, and paid £10,000 in dividends. In No. 1 shaft, which had now reached a depth of 2,023 feet, the 2,000-ft. cross-cut was begun. The 1820-ft. level proved disappointing, and several rises put through to the 1,720-ft. level yielded only low-grade stone. The 1,720-ft. level and stopes were worked out. Diamond drilling in an easterly direction from the 2,000-ft. level gave no promising indications. At No. 2 shaft on the Guiding Star line there was no new development, but the 1,200-ft. and 1,300-ft. levels proved an abundance of barren quartz. The stopes at and below 1,100 feet were in progress on leaders and spurs west of the large lode formation; these added considerably to the gold return. About 340 men were in the employ of this company throughout the year, and the wages alone exceeded £34,000. Prospecting at the Band and Albion Consols was still in progress; the calls for carrying on this work had amounted to over £60,000 in six years, and so far the results were not encouraging. At 1,800 feet there were some payable veins west of No 9 shaft, and at the 1,900-ft. level an east cross-cut was in progress to test the Consols lode, work on that line from No. 7 shaft having been abandoned. The Sir Henry Loch kept up well, returning 4,226 oz. from 6,533 tons and paying £4,800 in dividends. The North Band and Barton Company was still engaged at shallow levels, and the tributers crushed some poor stone left in the old stopes. The Prince of Wales and Bonshaw Company paid a dividend towards the end of the year, having found payable stone at the 954-ft. level, and carried out extensive stopes from the 1,154-ft., 1,054-ft., 954-ft., and 845-ft. levels; 8,557 tons crushed during the year yielded 4,670 oz. of gold. Vigorous prospecting at the South Plateau, the Central Plateau, and the Northern Star still failed to locate payable ore, although large blows of quartz were tried at various places.

At Ballarat East large quantities of quartz were treated with varying success. The Last Chance Company crushed 23,000 tons for 7,094 oz., and paid £6,500 in dividends. The stopes on the Pug lode to a depth of 700 feet opened up large bodies of quartz. Yields from the Llanberris No. 1 were very low, and further calls were required for prospecting work, but the parent company, the Llanberris, put through its largest tonnage for twenty years and returned the largest gold yield, 18,430 tons for 5,649 oz. At the New Speedwell 14,625 tons, the largest tonnage to date, yielded 4,923 oz. The returns from the New Normanby (16,012 tons for 5,648 oz.), and the North Woah Hawp (12,070 tons for 4,379 oz.) were both records to date, and enabled dividends of £2,400 and £1,650 respectively to be paid. At the latter mine several fine nuggets weighing up to 100 oz. were taken from the indicator veins at the 600-ft. level. The Victoria United was still engaged in prospecting, and the Britannia United merely paid expenses, large bodies of stone of very low grade being opened.

## 1895.

In 1895 only £18,100 was paid in dividends by mines in the vicinity of Ballarat; calls amounted to several thousand pounds. The total gold yield was 68,664 oz., valued at over £275,000. Very extensive prospecting was carried out both at Sebastopol and at Ballarat East. The various mines where stoping and development were in progress treated large tonnages. The number of miners employed throughout the year averaged 2,716.

At Sebastopol the most encouraging sign was that the South Star mine began to pay dividends, and continued to pay at regular monthly intervals. This helped in a small way to compensate for the suspension of dividends by the Star of the East, which had distributed £276,000 in dividends and £280,000 in wages within eight years, the total expenditure being over £700,000. The South Star Company was engaged on the Guiding Star lode, where several levels from a blind shaft had intersected the reef, and stopes up to 30 feet wide yielded ore of more than payable values. Prospecting was also in progress on the Consols line to a depth of 2,000 feet, but nothing of value was disclosed. Prior to getting any returns the shareholders in this company paid £66,000 in calls. At the Star of the East the payable ore at No. 1 shaft was nearly exhausted. To economise in the cost of pumping and baling, Nos. 1 and 2 shafts were connected by a cross-cut, and a large beam-engine pumping plant was erected at No. 2 shaft. A drive along the lode-track at 2,000 feet in No. 1 shaft revealed no payable reef. At No. 2 shaft ore from the stopes on the Guiding Star lode and veins became poor, and extensive prospecting

failed to disclose any new bodies of stone. The Band and Albion continued prospecting west of the shaft to a depth of 1,900 feet on the Consols line; since dividends stopped on 18th July, 1888, £70,000 had been paid in calls by the shareholders, but no large body of payable ore had been located. To cope with the water at No. 9 shaft a beam-engine with 60-in. cylinder was erected during the year. The Sir Henry Loch Company amalgamated with the North Band and Barton, and obtained an area on tribute from the Band and Albion. Prior to the amalgamation the Sir Henry Loch Company was in a bad way, but from the two shafts now in use the company as well as tributers secured a fair return, though the year's result was the poorest in the history of the mine. Up to the date of amalgamation the Sir Henry Loch Company had won 43,564 oz. of gold valued at £180,321, and paid £64,939 in wages, £63,600 in dividends, and a royalty of £12,933, on a called-up capital of £12,000. The New Kohinoor Company worked the old gutter, the wash-dirt being crushed instead of puddled; the yields sufficed to pay expenses, but left no profit. The Northern Star Company was engaged at the 1,250-ft. level in driving a long cross-cut west from the shaft. The Central Plateau Company, spurred to greater activity by the development in the South Star, continued prospecting, but met with nothing payable. The Sebastopol Plateau No. 1 mine was idle. The South Star Extended (formerly the South Plateau) and the Prince of Wales companies continued a fruitless search. The Prince of Wales and Bonshaw dropped from the prominent position which it had gained in 1894, and had to make calls to pay for the large battery which had just been installed. A promising body of quartz up to 20 feet wide was proved, but it extended only for a short distance. The Prince of Wales Company ceased operations after extensive but unsuccessful prospecting to a depth of 500 feet.

Among the Ballarat East mines the Last Chance United led the way both in tonnage and yield, with 7,419 oz. from 24,995 tons. The main stopes were still above the 700-ft. level, while further sinking was in progress. Returns from the Britannia shrank to 1,485 oz. from 2,782 oz. in 1895, and those from the Llanberris to 1,941 oz. from 5,649 oz. in the previous year. The Llanberris No. 1 returned only a couple of hundred ounces while prospecting operations were being carried on to a depth of 830 feet. All work at the Llanberris was carried on by tribute parties, and the returns were chiefly from No. 4 shaft, where the Indicator and eastern country were explored at 660 feet and rich veins were located; at No. 3 shaft driving north was in progress on the Sulieman line at the 500-ft. and 600-ft. levels, but the quartz was poor; at No. 2 shaft a few tributers were engaged with varying success. The New Speedwell Company had a highly successful year, with 6,142 oz. from 12,066 tons crushed; the deepest workings were at 700 feet, and the Indicator veins contributed largely to the yield. A few dividends were declared. The New Normanby and North Woah Hawp mines produced 4,553 oz. from 12,778 tons, and 3,460 oz. from 8 969 tons, respectively; the Indicator slates and the western slates were the lines to which most attention was paid. From the western slates the Prince Regent Company had some rich returns which enabled it to pay dividends again. At the Dalzell-cum-Prince Regent a large tonnage was put through, but the yield was smaller than it had been in the past two years. The British Queen Company increased its output. At the Sulieman Pasha the output fell away to less than half, although the stopes looked well in places; a considerable amount of prospecting was in hand. At the Eastern Star Freehold and Eastern Star Extended highly profitable stone was won, but the yield from both claims, especially that from the Eastern Star Extended, were smaller than they had been in 1894. The output of gold at the Black Hill mine continued to diminish; most of the work was done at the upper levels by tributers in search of veins on the Indicator. The Victoria United, formerly known as the New Victoria, found payable ore during the year, and began crushing; meanwhile several tribute parties were fortunate in locating rich veins, which enabled the company to carry out much dead work. Several parties were successful on the White Horse Ranges near the Dalzell-Buchanan; of these Little's Defiance and Carnegie and party continued operations throughout the year. The New Britannia Company, formerly known as the South Britannia, worked in the old alluvial with moderate success at times. The North Prince Regent, Dalzell-cum-Prince Regent, Woah Hawp Canton, and Tinworth's party maintained good average returns, while small but rich crushings were won by the Golden Gate and the Indicator Companies to the south of the big cross-course.

## 1896.

In 1896 the results from the South Star and Central Plateau mines were the outstanding and most encouraging features of mining at Ballarat. The South Star continued its payable returns, and the Central Plateau found an extension of the lode with coarse gold; both mines paid dividends by the end of the year. The Sir Henry Loch United, after a period of depression, again had profitable results, and paid a dividend. The other mines were still prospecting and making calls.

The gold won by the South Star mine came from the blind-shaft workings below the 720-ft level on the Guiding Star line, the prospecting operations between 1,700-ft. and 2,000-ft. levels on the Consols line failing to locate any ore of value. Additional costly machinery, comprising a complete winding and crushing plant, was installed, and a large cyanide plant to treat the tailings was built on the bank of the Yarrowee at a distance of nearly a quarter of a mile from the mine. At the Central Plateau mine a very rich shoot was found at the 860-ft. level on the Guiding Star line of lode; a drive was begun north towards the South Star, and stopes proved the formation to be 20-ft. wide. During the next three months 4,931 tons yielded 4,009 oz. The quartz was carted to the Star of the East battery for treatment. At the Star of the East No. 1 shaft, 1,000 feet of driving on the Consols line at the 2,000-ft. level failed to locate the rich shoot worked in the levels above; prospecting at the 300-ft. level was in progress in an easterly direction. At No. 2 shaft, now over 1,800 feet deep, prospecting was carried on by cross-cuts; at the 1,500-ft. level the western cross-cut was driven over 1,300 feet towards some quartz discovered in a horizontal diamond drill bore. Veins and small blocks in the old stopes at and near the 1,100-ft. level on the Guiding Star line contributed the larger part of the 15,810 tons, which yielded 3,229 oz., the smallest return for ten years.

The Sir Henry Loch United Company was successful in locating payable quartz in the ground formerly held by the North Band and Barton; the bulk of the quartz came from the 1,620-ft. level and above, as the reef was faulted at the lowest level. In some places above the 1,620-ft. level the reef was upwards of 20 ft. wide and payably auriferous throughout, but the richest stone was found in the eastern wall. The extra cost incurred at No. 2 shaft was considered unwarranted, and operations were therefore confined to the No. 1 or main shaft. A dividend amounting to £1,625 was paid before the end of the year. At the Northern Star mine the western cross-cut at the 1,250-ft. level was extended to 2,450 feet from the shaft, several lines of lode being passed through, including one in the face 4 ft. to 5 ft. wide; drives averaging 100 feet were put in along these reefs, but the best ore found yielded only 3½ dwts. to the ton. Owing, however, to the large quantity of water and the inability of the plant to cope with it, the cross-cut was closed and operations were confined to the Guiding Star line near the shaft between the 1,250-ft. and 1,100-ft. levels. The Band and Albion Company's workings were still unprofitable, though small crushings from the 1,800-ft. level were payable at times. At the 1,900-ft. level, both west of the shaft and on the Consols line, nothing of value was discovered. The New Kohinoor Company continued to work the alluvial and frequently found small patches of payable wash and cement. To test the Guiding Star line of lode a new shaft was sunk to a depth of 300 feet before the end of the year.

The discovery of the rich stone in the Central Plateau caused the Sebastopol Plateau No. 1 Company to renew active operations and to drive north on a large well-defined body of mineralized quartz throughout the year, but without success. The Prince of Wales and Bonshaw Company, whose shaft was now 1,254 feet deep, was still prospecting at the deeper levels, while the stopes yielded stone of high average value but not in sufficient quantity to enable any profits to be made, and calls were therefore essential to carry on the works.

At Ballarat East the mines showed little change. An increased output by the Britannia Company helped to compensate for a decreased return by the Last Chance, but the Black Hill, the Llanberris, the New Speedwell, the New Normanby, and the North Woah Hawp were all giving poorer results. The Dalzell and Buchanan Company ceased work during the year. The return from Tinworth's private claim was good, nearly 1,100 oz. being won, but that from the adjoining Woah Hawp Canton was poor. The Dalzell-cum-Prince Regent yield improved. The North Prince Regent Company had passed its zenith and the returns were decreasing. Yields from the British Queen improved, but no work was carried on in the claims to the south, where the Tower Hill Company and others held extensive areas. The Sulieman Pasha and the Eastern Star Freehold had smaller returns, but the Eastern Star Extended crushed more ore and yielded considerably more gold in 1896 than in the previous year.

## 1897.

In 1897 there were no new developments, notwithstanding vigorous prospecting by the mines at Sebastopol. The South Star and Central Plateau companies continued to mine payable ore from the Guiding Star line of lode, and the former paid regular dividends. There was marked decrease in the quantity of the ore crushed throughout the district, but the Sebastopol mines were in no way responsible for this.

The principal operations of the South Star Company were on the Guiding Star lode at a depth of 970 feet and above, where a width of over 30 feet was mined; the work was carried on from the blind shaft. At the Central Plateau the lode at the 980-ft. level was small compared with that worked at the 860-ft. level and stopes, dividends were irregular, chiefly owing to a slump in values early in the year, but the total output for the period was 8,472 oz. from 20,133 tons. The Sir Henry Loch United continued to pay dividends for part of the year, but later on the ore became poor and unprofitable. At the Star of the East the location of a payable shoot 100 feet in length on the Albion lode at the 1,500-ft level led to the extension of other cross-cuts in that direction. A fairly regular output was provided by the stopes on veins and spurs west of the old workings on the Guiding Star lode. At No. 1 shaft operations on the Consols line were continued at the 2,000 ft. level. For the year 19,960 tons yielded 5,249 oz., which sufficed to pay for prospecting and development, but left no profit for the shareholders. At the Prince of Wales and Bonshaw, the Sebastopol Plateau No. 1, the Kohinoor and the Northern Star mines nothing of value was met with. At the Band and Albion the hopes of locating payable stone west of the shaft at the 1,900-ft. level were shattered, only a small portion of the ore being payable.

In the Ballarat East mines there was little development. Deeper sinking was the order of the day among the progressive mines, and was attended by fair success in several instances. The Black Hill Company was nearing the end of a career extending over 35 years, the shallow levels being practically exhausted. The Victoria United was working its way into prominence as a gold producer, but remained on the call list owing to additions to the machinery, &c., while shaft-sinking and opening up of the 1,000-ft. level were undertaken. The Britannia United found a large body of quartz in the stopes, and crushed 20,551 tons for 6,070 oz. The Last Chance produced more gold from a considerably smaller tonnage of ore. The Llanberris No. 1 Company paid dividends, opened up a large body of payable stone at the 930-ft. level, and erected a new battery. At the Llanberris Company operations were continued at Nos. 2, 3 and 4 shafts by the tributers; a short shoot on the Sulieman line was found north at the 600-ft. level from No. 3 shaft, and operations at No. 4 shaft ceased during the year. At the New Speedwell the sinking of No. 3 shaft (afterwards known as the North Normanby) was in progress. A further falling-off in the returns took place at this mine and also at the New Normanby, the North Woah Hawp, and the North Prince Regent mines. At the Prince Regent and at Tinworth's the prospects improved and dividends were paid. The Woah Hawp Canton Company was reconstructed under the name of Sun You Hing. The Dalzell and Buchanan Company resumed operations. Yields from the British Queen fell away. The Sulieman Pasha yields decreased still further, and crushing ceased towards the end of the year. The Eastern Star Extended had a good year. The First Chance Company began to produce gold, the auriferous quartz

coming from a depth of 350 feet between the Indicator and Sulieman lines of lode. A new company called the Exchange was formed to work the untested lines of lode east of the Indicator belt. Little success attended the operations of the New Britannia in the alluvial section.

## 1898.

A marked fluctuation in the gold returns occurred during the year 1898. For the first six months there was a decided falling-off in the output of such prominent contributors as the Star of the East, the Central Plateau, the Sir Henry Loch United, the Speedwell and the Last Chance United mines. About the middle of the year, however, the Speedwell, the Last Chance United, the Llanberris, the Llanberris No. 1, the New Normanby, the Victoria United, and the North Prince Regent began to improve, and by the end of the year these mines were responsible for a recovery in the gold return of the eastern belt, but on the western line the Central Plateau almost totally collapsed. The Star of the East produced considerably less gold, and the output of the South Star continued to decline. The feature of the moment was the discovery of payable quartz at the 900-ft. level in the Sebastopol Plateau No. 1; a battery, &c., was erected, but a cross-cut over 1,500 feet in length proved no further payable ore.

The Star of the East Company intersected the Albion lode at the 1,100-ft level and proved the formation to be payable, but the results at the 1,500-ft. level were disappointing. Work was resumed on the Guiding Star lode in the southern portion of the mine, payable stone was located, and stoping was begun. At the 1,800-ft. level the workings failed to prove anything of value, and the bulk of the stone crushed came from the western veins at the 1,000-ft. and 1,100-ft. levels. At No. 1 shaft drives on the Consols line from the 2,000-ft. level and from a winze below that level located nothing of value. A little stoping above the intermediate level over the 2,000-ft level produced low-grade quartz only. The chief workings were separated from the old stopes by a cross-course. A drive north from the cross-cut failed to meet with anything to warrant its continuation, and this shaft was closed down during the year. The yield was 4,252 oz. from 15,966 tons.

The Sir Henry Loch United and the Band and Albion Companies amalgamated under the name of the Band and Loch United. Prior to amalgamation the returns from both companies practically ceased, only a few small blocks being stoped by the tributers in the Sir Henry Loch. The South Star Company, which had resumed shaft-sinking in the previous year, reached 2,500 feet by September and located the Consols line of lode in the east cross-cut; this was the deepest point at which the formation had been tested. At the 2,250-ft. level the Consols lode was driven on, but proved small and unpayable, though gold-bearing. The Northern Star continued to prospect the Guiding Star lode near the shaft; over 1,000 feet of laminated quartz with a good foot-wall was opened up, but very poor prospects of gold were obtained. The Central Plateau stoped quartz of varying quality which was exhausted by the close of the year, a few spurs and veins being all that remained; the yields fell from 2.058 oz. for the first quarter of the year to 66 oz. for the last quarter, the output for the year being 4,123 oz. from 14,565 tons. The Prince of Wales and Bonshaw Company mined a small lode, the value of which was lower than in previous years, and sustained a considerable loss in working.

At Ballarat East the returns from the deeper levels were most gratifying, although the amount of country opened up was as yet small compared with the extensive prospecting at shallow depths. The Victoria United at 1,005 feet was engaged on a payable formation 35 ft. wide, while at the 900-ft. level a series of spurs and flat makes yielded quartz of good quality; the return for the year, over 7,120 oz. from 13,394 tons, enabled the company to clear off all liabilities and to obtain a good footing. Yields from the Britannia fell away, but prospects improved at the Last Chance United, where a body of quartz 60 ft. wide was profitably mined at the 1,000-ft. level. The Llanberris Company's tributers won a small quantity of good ore, which enabled the proprietary to pay an occasional dividend. At the Llanberris No. 1, the stopes at and above the 930-ft. level yielded a large quantity of payable stone, 16,498 tons being crushed for 4,243 oz. during the year, and several dividends were paid. At the New Speedwell the returns were slightly lower. The North Prince Regent and the North Woah Hawp companies resumed shaft-sinking, and the latter reached a depth of 1,050 feet. Over 1,000 oz. more gold was won than in 1897, which had been the poorest for nine years. The New Normanby produced 6,596 oz. from 19,330 tons against 2,581 oz. from 7,881 tons in 1897.

The Prince Regent, Tinworth's, the Sun You Hing, and the Dalzell-cum-Prince Regent gave varying results throughout the year, but the returns were small. The Dalzell and Buchanan Company continued to mine low-grade quartz averaging under 2 dwt. to the ton. The British Queen persisted in prospecting, though in a half-hearted manner, and met with little success. The Sulieman Pasha and Black Hill companies ceased operations. Returns from the Eastern Star Extended fell away from 1,682 oz. to 168 oz. for the year. The First Chance and the East Sulieman companies won stone of good average quality from comparatively shallow levels.

## 1899.

In 1899 mining at Sebastopol was on the down grade. The South Star Company was engaged in mining low-grade ore to the west of the main lode at the 1,000-ft. level and above. Prospecting operations at the deeper levels for the Consols lode had failed to locate anything of value, and at the 2,500-ft. level the eastern cross-cut was put in a total distance of 880 feet in search of new formations. The ore was of lower average value than it had been in 1898, 28,000 tons yielding 7,404 oz. The costs per ton for a half-year were—

| | s. | d. |
|---|---|---|
| Mining ... ... ... | 6 | 4 |
| Filling and trucking ... ... | 2 | 5 |
| Haulage and surface labour ... | 1 | 9 |
| Development ... ... ... | 1 | 4 |
| Stores, fuel, sundries ... ... | 2 | 10 |
| Milling ... ... ... | 1 | 8 |
| Chlorination and cyaniding ... | 1 | 0 |
| Total ... ... ... | 17 | 4 |

At the Star of the East, the Albion lode provided most of the quartz crushed; it was worked to a height of 320 feet above the 1,100-ft. level

and from the south drive at that depth. To a smaller extent veins and spur on the Guiding Star line in the southern portion of the mine helped to maintain a fair average. For the year 14,265 tons yielded 6,214 oz. All work at No. 1 shaft was stopped.

The Band and Loch Company located the downward continuation of the Sir Henry Loch shoot at the 1,900-ft. level, and began stoping above and below the drive. The Central Plateau Company opened up spurs and blows of poor quartz at the 1,100-ft. level, but the grade was low, and monthly calls of 6d. were necessary. The Sebastopol Plateau No. 1 Company, after several trials, proved the stone in the 1,000-ft. and 900-ft. levels to be of low grade. The Prince of Wales and Bonshaw continued prospecting as in the past, but without encouraging results. The Northern Star failed to locate anything of value in the shallow levels and closed down. The New Kohinoor also closed down at both Nos. 1 and 2 shafts. The South Star Extended, after persistent prospecting, suspended operations at No. 1 shaft.

At Ballarat East the principal development was the discovery of a large payable formation at the 980-ft. level in the North Woah Hawp. The return from this mine was 4,107 oz. from 14,077 tons crushed, and dividends amounted to £1,200. The New Speedwell also improved, yielding 4,225 oz. from 15,395 tons, the largest tonnage crushed to date; the bulk of the stone came from the 600-ft. level and above. The output from the New Normanby was slightly smaller, but the average value of the stone was very much the same as in the past. The Victoria United Company paid £4,000 in dividends, and also purchased the battery of the defunct Black Hill Company. The mine was opened up to a depth of 1,106 feet, where payable stone and nuggetty patches were worked, and the 1,005-ft. level also yielded large quantities of good ore. The Llanberris Company's yields fell off rapidly. The Llanberris No. 1 maintained its usual average. At the Last Chance over 25,000 tons of quartz yielded 6,959 oz. of gold; the bulk of the quartz came from the 1,000-ft. level and a stope over the back. Both tonnage and gold returns from the Britannia United decreased. The workings were now 1,150 feet deep. The Exchange Company, after much prospecting, suspended operations.

The British Queen Company located payable stone at the 800-ft. level, and the Dalzell and Buchanan Company had a slightly better average return for the year. The New Zealand Trust Company secured the lease of the Black Hill Company, and began to sink a new shaft. The North Prince Regent, the Sun You Hing, Tinworth's, the East Sulieman, and the Eastern Star Extended had smaller returns, but gave a small profit to the shareholders, the bulk of whom were working in the respective claims.

## 1900.

The year 1900 was marked by occasional prospects of revival in the expiring Sebastopol mines. At the Band and Loch there were some hopes of a new lease of life on the Consols lode; the company's liabilities were paid off, but then the value of the ore fell away, and calls were necessary for carrying on the development work. The bulk of the stopes were let on contract to tribute parties, who worked a great width of flat veins to the 2,080-ft. level by means of a blind shaft. Horses were used to convey the quartz from the blind shaft to the main shaft at the 1,900-ft. level, this being the greatest depth at which they were utilized on the field. At No. 7 shaft a few tribute parties, inspired by the revival of the deeper levels, began operations. At the Star of the East some rich veins of fair extent were found on the western side of the Guiding Star lode workings. Prospecting to a depth of 1,900 feet was carried out in search of further veins, but without success. On the Albion lode the workings above the 1,100-ft. level, having reached a slide, were abandoned, and stoping between the 1,500-ft. and 1,100-ft. levels was begun on a limited quantity of good stone. The old Guiding Star shaft was re-opened by the company, and was repaired for future operating. The Central Plateau Company showed signs of increasing activity, the discovery of some gold-bearing spurs at the 1,100-ft. level easing the amount of calls for a month or two, and leading the company to erect a modern 20-head battery at the mine. The crushings prior to this had been carried out at the Star of the East battery. At the South Star the yield decreased still further. A small shoot on the Consols line was tested above the 2,375-ft. level, but proved unpayable. A temporary revival took place at the Prince of Wales and Bonshaw, where payable stone was located in a rise above the 1,254-ft. level at a point 1,425 feet north of the main cross-cut. A small patch of good ore was proved on the footwall side of the lode, 41 tons yielding 27 oz. The Sebastopol Plateau No. 1 Company continued a fruitless search at the 1,000-ft. level, though driving along a well-defined lode. Prospecting operations by the South Star Extended were unsuccessful. The New Kohinoor, after a short suspension of operations, resumed prospecting.

At Ballarat East yields from the Last Chance, the New Speedwell, and the Llanberris No. 1 companies were greatly reduced, and those from the Victoria and the New Normanby were also smaller, but the Britannia United and the North Woah Hawp saved the situation with improved returns. The workings were now at a depth of over 1,000 feet in all these mines, with the exception of the New Speedwell, where operations were confined to the shallow levels. The British Queen tended to improve. Tinworth's, the Dalzell and Buchanan, and the Sun You Hing were without change. A development in the new shaft workings of the Exchange Company attracted attention on account of being on a new line of better country. The New Britannia Company still fossicked in the vicinity of the worked-out alluvial with only moderate success. The First Chance yields, though small, were encouraging. The Eastern Star Extended and the East Sulieman closed down during the year.

## 1901.

In 1901 there was little change in the mines at Sebastopol. At the Band and Loch a bold policy of development was undertaken, viz., to sink the shaft 400 feet below the 1,900-ft. level, and to cross-cut for the lode at that depth. The tributers who worked the Consols lode paid a fair return to the company, and this, together with regular calls, was necessary to meet the expenses of the scheme. The returns for the year amounted to 4,235 oz. from 10,856 tons. At the Star of the

East operations on the mineral lode at the Guiding Star shaft resulted in the location of payable ore, and powerful machinery was erected for winding and pumping.

Yields from the South Star steadily declined, and the amount of stone in sight was now limited. The returns from the new battery of the Central Plateau Company enabled the mine workings to be carried on with fewer calls, but only a small amount of payable stone was located. Operations were confined to above the 980-ft. level. At the Sebastopol Plateau No. 1 the western cross-cut at the 900-ft. level was extended towards the Prince of Wales lode, but nothing of consequence was met with. At the Prince of Wales and Bonshaw a small quantity of good ore was mined, but the search for large bodies proved unsuccessful. The South Star Extended devoted attention to the alluvial within its lease, and confined lode operations to No. 2 shaft, where extensive cross-cutting, at a depth of 625 feet, was undertaken. The total distance between the faces was 2,450 feet, but no payable quartz was found, though numerous tracks were cut.

But little change took place among the mines of Ballarat East throughout the year: large bodies of quartz were mined and crushed, and occasional dividends were paid by several of the companies at irregular intervals. The Victoria United paid one dividend, added to the plant, and continued prospecting at a depth of 1,100 feet. The average value per ton for the year was about 6 dwt. At the Britannia United a large body of stone was worked in the northern end of the mine: but since shaft sinking was not continued, and the blind shaft workings were abandoned, the lower limit of the stone was always in sight. At the Last Chance the 1,100-ft. level proved disappointing, but the downward continuation of the lode worked at the 1,000-ft. level was located during the year by an intermediate level.

The First Chance tributers obtained fair returns from the shallow workings. At the Llanberris No. 1 operations at the 1,030-ft. and shallower levels were continued without any profit to the shareholders. At the New Speedwell the yields fell off. The returns from the North Woah Hawp averaged about the same as in 1900, while those of the New Normanby decreased by nearly 2,500 oz. The Exchange Company continued to attract attention, very rich patches being met with at times. There was no improvement in the quality of the ore from the Dalzell and Buchanan mine. The British Queen worked stone of better quality than in 1900. Prospecting operations, so far unsuccessful, were continued by the New Zealand Trust Company on Black Hill.

The number of miners employed in the district had gradually diminished during the past ten years; throughout 1901 the average number of men employed was 2,092. The gold return (49,507 oz.) was the lowest for the field up to date, and, consequently, the amount paid in dividends, totalling only £5,183 for the year, was the smallest on record.

## 1902.

After such a poor year as that just passed a tendency to return to more prosperous times in 1902 was unduly magnified. The workings to a depth of 490 feet on the Mineral lode at the Guiding Star shaft not only enabled the Star of the East Company to pay off its indebtedness, but also to disburse 7s. per share in dividends, and to carry on prospecting operations in No. 2 shaft. The year's yield totalled 15,968 oz., of which 13,701 oz. came from 36,667 tons of the Mineral lode and the balance from the No. 2 shaft. Towards the end of the year the Mineral lode at the lower level (490 feet) became poorer. Stimulated by the success of the Star of the East Company, the Band and Loch Company stopped shaft sinking, and drove along the line of the Guiding Star lode at the 400-ft. level, but over 1,000 feet of driving failed to prove any payable ore, and shaft sinking was resumed by the end of the year. The tributers on the Consols lode were still stoping and blocking out veins, which averaged nearly 9 dwt. to the ton, 7,521 tons yielding 3,090 oz.

At the South Star the chief operations were below the 1,010-ft. level on the Guiding Star lode, where prospecting was in progress at the 1,100-ft. and 1,200-ft. levels; a few veins in the higher levels yielded a small quantity of rich stone. The Central Plateau continued to prospect at the 980-ft., 860-ft., and 600-ft. levels, and made regular monthly calls. Large blows of stone were opened at the 980-ft. level, but they proved unpayable. At the Sebastopol Plateau No. 1 a payable lode, the Phœnix, was cut at the 288-ft. level, and yielded 5,194 oz. from 8,095 tons; dividends of 5s. per share were paid. This discovery led the South Star Extended to revive operations at No. 1 shaft, with the result that the lode was found at the 200-ft. level. No new finds were made at the Prince of Wales and Bonshaw during the year, and crushing ceased.

In 1902 the prospects of the mines at Ballarat East improved. The Llanberris No. 1, the Last Chance United, the New Normanby, the North Woah Hawp, the Victoria United, and the Britannia United gave better returns, and the Woah Hawp Canton (formerly Sun You Hing), Tinworth's, and the First Chance companies held their own. The Dalzell and Buchanan, the Exchange, and the British Queen had poor crushings, and the New Zealand Trust Company's trials were poor.

The North Woah Hawp Company worked some rich veins on the Indicator at 980 feet, 10,679 tons yielding 6,135 oz.; this was the best average return to date. The New Normanby opened up a large body of payable ore at the 1,300-ft. level, and an abundance of quartz of fair value showed throughout in the stopes. The Llanberris No. 1 paid one dividend of 1s. after nearly four years of unprofitable working. A large body of quartz was exposed at the 1,030-ft. level north, and yielded from 6 dwt. to 9 dwt. to the ton. At the 930-ft. level the stone was poor. The return from 12,185 tons was 4,888 oz. of gold. The Victoria United began the year under a cloud; at the 1,005ft. and 1,105-ft. levels large low-grade formations were met with. Shaft-sinking and cross-cutting at the 1,205-ft. level added to the costs of mining, and no dividends were paid, although 7,399 oz. of gold was obtained from 25,159 tons treated. The average value fell from 6 dwt. 10 gr. to 5 dwt. 19 gr. per ton during the year. The Last Chance United continued to work the large formation at and below the 1,000-ft. level, but the values depreciated towards the end

of the year. The Britannia United confined its operations to stoping in the levels already opened, and at times had encouraging prospects.

A cross-cut was extended west towards the recently acquired Sulieman Pasha line at the 720-ft. level. The First Chance, now 500 feet deep, had payable bodies of stone at several levels, and won 1,954 oz. of gold from 4,375 tons of quartz. The New Speedwell Company closed down, and the southern portion of the lease, including the No. 3 shaft, was acquired by the North Normanby Company, which began operations with a number of tribute parties.

## 1903.

In 1903 most of the mines at Sebastopol were approaching their end. The South Star ceased operations, having worked out the Guiding Star lode and meeting with no success in prospecting the Consols lode. The Central Plateau resumed operations at the 1,100-ft. level, while prospecting was continued at the 980-ft., 860-ft., and 600-ft. levels. Owing to the accumulation of water in the now abandoned South Star line, the lower levels of the Central Plateau had to be abandoned, and a start was made to re-open the Red Jacket alluvial shaft. The yield was only 48 oz. from 250 tons, and regular calls had to be made. The Band and Loch contractors on the Consols lode opened up further bodies of payable stone. With regular calls, the sinking of the shaft to 2,300-ft. level, and cross-cutting east at that depth and west at 2,100 feet were undertaken; the yield for the year amounted to 4,663 oz. from 7,610 tons. At the Star of the East the stopes in the upper levels on the Mineral lode were nearly exhausted, and several winzes below the 490-ft. level had broken into the stopes from the old No. 1 shaft workings. At 2,200 feet, in the No. 2 shaft, cross-cutting towards the Consols lode was continued to 550 feet from the shaft, and a drive north was also continued along a spurry formation cut at 400 feet in the west cross-cut, which had been driven 880 feet from the shaft during the past year. The stone proved low-grade and the drive was abandoned pending the deepening of the main shaft, which reached a depth of 2,260 feet early in the year. A cross-cut was driven 386 feet west at this level; at 300 feet a leader was cut, but work here ceased in September. The year's return was 5,186 oz. from 26,182 tons, of which 22,960 tons was mined prior to the end of June. At the Sebastopol Plateau No. 1 and the South Star Extended, stoping and driving was continued on the Phœnix lode, the returns being 5,128 oz. from 10,383 tons and 370 oz. from 1,105 tons respectively.

At Ballarat East the largest dividends were paid by the North Woah Hawp mine, which distributed £6,000; then followed the Llanberris No. 1 with £4,200, and the Victoria United with £2,000. The New Normanby and the Last Chance Companies paid no dividends, but managed to hold their own during the year. The yield from the Britannia United improved, but no dividends were paid; the location of a new formation, known as Dunn's lode, at the 720-ft. level caused renewed prospecting to be undertaken at the shallow levels along the line. Prospecting operations by the New Zealand Trust Company opened up some payable stone, 1,794 tons being treated for 479 oz. The yield from the First Chance improved, but increased expenditure lessened the amount paid in dividends. The Woah Hawp No. 1 (formerly the British Queen) was engaged in shaft-sinking and attained a depth of over 900 feet. Unsuccessful prospecting was continued by the Exchange Company. The Llanberris No. 2 Company (formerly the New Speedwell) re-opened the shaft and continued prospecting.

## 1904.

During 1904 mining at Sebastopol was at a low ebb. The South Star remained idle and in consequence water found its way into the Star of the East Company's No. 2 shaft and caused trouble. The Guiding Star shaft was closed down as the stopes were exhausted. The Prince of Wales and Bonshaw after a lengthy career of prospecting, which led to the discovery of only a small quantity of good ore, also closed down, and the Sebastopol Plateau No. 1 and the South Star Extended ceased work, having exhausted the payable ore on the Phœnix reef. The Central Plateau was swamped by water from the South Star, and operations were suspended at the main shaft, and after a time at the Red Jacket shaft also; nothing of value had been found in the latter workings. Towards the end of the year a settlement was arrived at with the South Star and the Star of the East regarding the water trouble, work was resumed, and the shaft was drained to the 1,100-ft. level.

At the Band and Loch prospecting west of the shaft by means of a cross-cut at the 2,100-ft. level was in progress, but, owing to a breakage of the pump-engine and the flooding of the mine, work in this cross-cut was not continued. On the Consols lode the tributers mined ore of average quality below the 1,900-ft. level. At the 2,300-ft. level the company extended a cross-cut in search of the downward continuation of the lode. For the year the return was 2,919 oz. from 5,815 tons.

At Ballarat East more prosperous conditions obtained. At the southern end of the field the Woah Hawp No. 1 Company discovered a rich formation at the 1,100-ft. level and paid dividends. The Llanberris No. 1 yielded well and paid £8,400 in dividends as well as £2,300 off the machinery account; the bulk of the stone came from a large lode-formation opened up north at the 1,030-ft. level and south between the 830-ft. and 930-ft. levels. At the Victoria United the output was 8,853 oz. from 23,783 tons; in 1903 it had been 7,037 oz. from 23,654 tons. The bulk of the ore came from the 1,215-ft. level. Four dividends of 6d. per share were paid for the year. At the Britannia United the output increased to 5,357 oz. from 4,163 oz. in 1903. The chief producing stopes were on the leather-jacket at the 980-ft. level and on Dunn's lode at the 840-ft. and 720-ft. levels. The Last Chance United Company crushed the same tonnage as during the previous year, but for a better return (3,297 oz.); the result, however, was not sufficient to pay for the prospecting work without the addition of small calls. The First Chance yields were low owing to dead work being carried out, but the opening up of new levels revealed payable bodies of stone. The North Normanby continued to make calls; the stone crushed was of higher average value, but was not in sufficient bulk to be payable. At the North Woah Hawp 23,581 tons yielded 7,521 oz. as against 15,688 tons for 7,895 oz. in 1903.

## 1905.

The year 1905 was a poor one for the mines at Sebastopol. The Star of the East worked a large spur west of the shaft at the 2,200-ft. level and below with encouraging results at times, but on the whole the stone was not payable. Prospecting at the same depth on the Consols line opened up a short make of gold-bearing quartz, but the formation was very small. The Central Plateau, having unwatered the 1,100-ft. level, located some gold-bearing spurs from which 259 tons yielded 122 oz. of gold.

At the Band and Loch the cross-cut east at the 2,300-ft. level was extended 1,000 feet from the shaft, and a drive was put in 700 feet north on the line of the Consols lode without locating any quartz of value. The South Star Company received a grant of £5,000 from the Government, and having unwatered the shaft resumed sinking and reached a depth of 2,700 feet by the end of the year. At 160 feet below the 2,500-ft. level the western track (an east-dipping leg) was cut in the shaft, but no gold was found in it.

Very little change was noticeable among the mines at Ballarat East; the crushings were still large, the average value moderate, occasional dividends the rule, and the workings shallow, considering the lengthy period of mining.

The largest output was from the North Woah Hawp (7,577 oz. from 28,219 tons); prospecting operations on the western lode at the 1,204-ft. level were disappointing and shaft-sinking was begun before the end of the year to test the formations at deeper levels. The New Normanby had an improved return, some good patches of gold being won at the 1,100-ft. level, while the large lode at the 1,300-ft. level towards the south boundary was opening up well. Further sinking was carried out by the Last Chance Company, which opened the 1,200-ft. level and began a west cross-cut. The average gold yield was slightly below that of the preceding year. At the Llanberris No. 1 there was marked falling off, but nine dividends of 6d. per share were paid; the chief stopes were at the 1,030-ft. level in the northern part of the mine. The First Chance mine crushed 6,769 tons for 2,650 oz. of gold, a good output considering its small area. The North Normanby Company maintained the average of the previous year, but no profit resulted.

The improved prospects at the Woah Hawp No. 1 were maintained throughout the year and led the company to erect an up-to-date battery of twenty heads and also to sink the shaft a further 100 feet, making the total depth 1,200 feet, and to cross-cut for the lode at that depth.

## 1906.

In 1906 the principal feature at Sebastopol was the better prospects from the Albion lode in the Star of the East. This portion of the mine was worked by tributers. West of the shaft at the 2,200-ft. level stoping was continued on a strong body of stone carrying from 3 dwt. to 5 dwt. per ton, but the spur was irregular in size and value.

At the Band and Loch, 3,763 oz. was won from 7,210 tons against 3,151 oz. from 6,333 tons in 1905. The contractors gave up their blocks, which were now worked by the company with wages men. Several new makes were opened from the air-winch shaft to a depth of 2,080 feet, but the 2,300-ft. level did not meet with success, although driven to 1,416 feet north, and a cross-cut was put in 333 feet west in search of the downward continuation of the large formations above. The South Star reached a depth of 3,170 feet by the end of the year, and began cross-cutting at the 3,100-ft. level. The Central Plateau continued prospecting and development, at times finding stone that paid expenses. The 1,100-ft. north drive reached the South Star boundary, and was extended by that company under agreement. Some ore of fair quality was in sight at the end of the year in the stopes over the 1,100-ft. level. The return was 1,967 oz. from 6,123 tons, and this, together with £3,250 received in calls, enabled operations to be carried on. At the Sebastopol Plateau No. 1 work was resumed, and attention was paid to the upper levels with but little result. The New Kohinoor after a period of idleness was re-opened, and cross-cutting east was begun at the 834-ft. level.

At Ballarat East the chief event was the closing down of the Britannia United; this mine had not returned any dividends for a few years, but had paid expenses during the greater part of the period and had employed from 100 to 150 men. At the Woah Hawp No. 1 the 1,200-ft. level failed to meet the rich formation proved in the 1,100-ft. level, and small calls were required to meet the expenses incurred for the erection of the battery and to provide working expenses.

At the North Woah Hawp the yield decreased. The New Normanby Company attained a depth of 1,500 feet, the deepest in the Ballarat East field; the yields for the first half of the year were augmented by some patches of gold on the Western Indicator at the 1,100-ft. level, but poorer results during the latter half, together with the cost of shaft-sinking, left no surplus for distribution as dividends. The Victoria United Company located a new gold-bearing formation at 50 feet west of the shaft in the 1,315-ft. level, which depth was attained about the middle of the year. Six dividends of 6d. each were paid as the result of crushing 30,896 tons for 9,789 oz. The returns from the Last Chance Company improved slightly; a new level was opened at 790 feet, and a connexion was made to the bottom of the First Chance workings at 700 feet from surface. At the First Chance mine where the bulk of the workings were on tribute, 3,334 oz. was obtained from 8,040 tons, which constituted the largest output from this mine. At the Llanberris No. 1 the yield continued to decrease, but three dividends were paid and the shaft was deepened to 1,230 feet. Abundant quartz was proved at 1,130-ft. level, but it was of poor quality. The Kia Ora Company took over the area formerly held by the New Zealand Trust Company on Black Hill, and erected a battery; meanwhile prospecting was continued at a depth of 600 feet.

## 1907.

In 1907 results at Sebastopol were not encouraging. The Central Plateau improved its position, work being carried on continuously and only two calls being required. Large bodies of low-grade stone were in sight, and 6,058 tons stoped returned 1,930 oz. The South Star Company on the Consols line drove over 250 feet northwards at the 3,100-ft. level on a lode from 12 in. to 18 in. wide, with only occasional traces of gold. At the Star of the East the stopes on the Albion lode were continued by tributers with fair results. A little stoping and prospecting was in progress on the

Consols line, and some payable stone was won on the western formation. At the Band and Loch mine the 2,300-ft. level was connected by a rise to the 2,080-ft. level, where stoping had been carried on, but intermediate levels opened from the rise failed to locate payable bodies of ore. Driving north and south at these levels was in progress at the end of the year. No discovery of value was made in the New Kohinoor mine, where an eastern cross-cut was being pushed ahead. The Sebastopol Plateau No. 1 closed down at the end of the year, after a fruitless search for alluvial at a depth of about 100 feet from the surface.

The principal event at Ballarat East was the location of payable ore in the New Normanby mine at the 1,500-ft. level, the deepest level in Ballarat East. In the same mine several patches of nuggetty gold also were obtained from the eastern stopes at the 1,300-ft. level, which was now 300 feet in length, from 10 ft. to 40 ft. in width, and 70 feet in height; a large formation with spurs was mined, and a mineral seam which crossed the veins was found to be the site of several lumps of gold. The Kia Ora failed to come up to expectations; the 600-ft. level was flooded, and tributers worked in the shallower levels and also in the vicinity of the open cut, but without much success. At the Llanberris No. 1, prospecting at the bottom level was unsuccessful, but the stone on the upper levels returned a fair profit; the year's return was 6,253 oz. from 23,598 tons, and seven dividends of 6d. each were paid. At the Last Chance a rapid decline had set in, and towards the close of the year the lower levels were abandoned for the time being. The First Chance also fell away considerably, only 785 oz. being won. At the North Woah Hawp rich stone from the western indicator was mined early in the year at the 1,200-ft. level and helped to keep up the general average; the shaft was deepened and the 1,273-ft. level was opened to work a large formation proved underfoot at the 1,200-ft. level; 19,868 tons yielded 6,589 oz. The Victoria United had the most favorable year in its career; 12,125 oz. was obtained from 32,376 tons, £10,000 was paid in dividends, and the old Queen's Jubilee shaft was equipped and repaired to 120 feet. The Britannia United Company passed out of the hands of the liquidator towards the end of the year. The New Normanby and Llanberris No. 2 continued prospecting, and though at times the results were encouraging, no payable formations were opened up. Continued prospecting was carried out at the Woah Hawp No. 1, and a new company, the Woah Hawp Central, began operations on the adjoining ground to the south.

## 1908.

During 1908 the South Star continued to prospect at the 2,750-ft., 3,100-ft., and 3,170-ft. levels; a small make of auriferous quartz was followed by a winze from the 3,100-ft. level, but, owing to the high cost of mining and to the excessive temperature, it was found to be unprofitable. On the Guiding Star line tribute parties worked at a depth of 1,200 feet from a balance-shaft, but the results were unsatisfactory. The Central Plateau continued operations between the 1,100-ft. and 980-ft. levels, but towards the end of the year the results were so poor that calls were necessary for carrying on the work. The Star of the East continued prospecting on the Consols lode and also west of the shaft at the 2,200-ft. level with poor results. The tributers on the Albion lode between the 1,100-ft. and 1,500-ft. levels won payable ore. At the Band and Loch, prospecting from the long rise failed to locate payable stone, though abundant quartz was found; in May the mine shared the fate of the others in the locality and closed down. A movement to prospect Ballarat resulted in the formation of the Ballarat North Prospecting Company, which began operations to the north of and on the same line as the Sebastopol mines, with assistance from the State; shaft-sinking and cross-cutting were carried on until the end of the year, but no auriferous quartz was found.

The chief producer at Ballarat East was the Victoria United, which headed the list with 10,480 oz. and paid £5,000 in dividends; work at No. 2 shaft (previously known as the Queen's Jubilee) was suspended after a depth of 316 feet had been attained, and the main shaft was deepened to 1,405 feet. The formation at 50 feet west of the shaft at the 1,300-ft. level was worked out during the year. Prospecting on the Duchess and on the "4-ft. slates" was continued at the 1,215-ft. levels, and payable stone was located. The reorganized Britannia began prospecting in the 720-ft. and 830-ft. levels and located veins carrying gold. At the Last Chance tributers above the 800-ft. level found a payable shoot, but the expense of pumping caused the mine to be worked at a considerable loss. The yields from the First Chance fell off still further; prospecting to the north-east and west of the shaft to a depth of 700 feet was carried on. The Llanberris No. 1 maintained its past average and paid 2s. a share in dividends. Prospecting was continued at the 1,230-ft. level, while five levels yielded crushing material. Returns from the New Normanby improved and £4,800 was distributed in dividends; seven levels were worked between 700 feet and 1,500 feet from the surface, and abundant quartz was exposed in the 1,300-ft., 1,400-ft., and 1,500-ft. levels. The North Woah Hawp Company continued to pay dividends during the first part of the year as well as to provide additions to the plant; the 1,283-ft. level opened up large bodies of payable stone northwards. No new makes were found at the Woah Hawp No. 1 mine. The Woah Hawp Central extended the cross-cuts east and west at a depth of 200 feet, but the veins passed through, though gold-bearing, were small.

## 1909.

The year 1909 witnessed the final stages of some of the large mines at Sebastopol. The South Star Company finally abandoned its workings early in the year, and shortly afterwards the Central Plateau Company's main shaft was closed down. The Central Plateau Company chose a new shaft site on the Albion line after putting down bores, and attained a depth of 80 feet before the end of the year. Up to the date of closing the main shaft, the balance-sheet was as follows:—

Receipts—

| | £ | s. | d. |
|---|---|---|---|
| Gold obtained, 30,822 oz. 14 dwt. 18 gr., valued at ... ... | 127,808 | 5 | 8 |
| Calls received ... ... | 85,512 | 13 | 4 |
| Other receipts ... ... | 3,226 | 15 | 8 |
| Total receipts ... ... | 216,547 | 14 | 8 |

Expenditure—

| | £ | s. | d. |
|---|---|---|---|
| Wages ... ... ... | 91,010 | 14 | 5 |
| Contracts ... ... ... | 26,016 | 13 | 1 |
| Fuel ... ... ... | 23,516 | 8 | 7 |
| Carting and crushing ... | 14,066 | 10 | 4 |
| Dividends ... ... ... | 13,750 | 0 | 0 |
| Ironmongery ... ... | 11,193 | 16 | 3 |
| Plant ... ... ... | 11,097 | 4 | 9 |
| Royalty ... ... ... | 5,160 | 0 | 0 |
| Timber ... ... ... | 5,211 | 1 | 8 |
| Other expenditure ... ... | 15,525 | 5 | 5 |
| Total ... ... ... | 216,547 | 14 | 6 |

The Sebastopol Plateau No. 1 again ceased operations; the Star of the East continued work under considerable disadvantages, owing to increased water from the abandoned mines, operations being confined to the Albion line of lode, where stopes at a height of nearly 400 feet above the 1,100-ft. level were worked, while the extension of the cross-cut at the 600-ft. level was undertaken. Much excitement was caused by the discovery of a rich patch of specimens in the Ballarat North Prospecting claim at the 350-ft. level, and the shaft was deepened during the year. Portion of the lease was floated as the Ballarat City Prospecting Company, and shaft-sinking was commenced. At the Kohinoor, owing to the flooding of the 834-ft. level, attention was paid to the 580-ft. level, where a drive on the Consols lode was cleaned out and work was resumed.

At Ballarat East the principal event was the discovery of a vein on the Indicator carrying a number of nuggets; it was found above the 820-ft. level in the Woah Hawp Canton, and was followed to the North Woah Hawp boundary.

To the south, Tinworth and party after a long career closed down their claim, which was then taken up by the Woah Hawp Canton. The North Woah Hawp Company worked the large lode at the 1,283-ft. level northwards and connected with the New Normanby stopes, but no dividends were paid. The New Normanby kept up the preceding year's average and paid eight dividends of 6d., making a total of £33,600 distributed to the end of the year; the total amount paid in wages was over £200,000. The Llanberris No. 1 Company won 5,390 oz., but distributed only £600 in dividends, while sinking the shaft another 100 feet. The Last Chance yield was poor and was won chiefly by tributers. At the Britannia, towards the end of the year, prospecting above the 720-ft. level opened up a large body of quartz. The First Chance Company continued prospecting on the Sulieman line of lode and met with encouraging prospects. The Victoria United Company disbursed £4,000 in dividends, sank the shaft deeper, and opened up the 1,400-ft. level; the bulk of the stone crushed came from the stopes on the leather-jacket at the 1,300-ft. level; 30,799 tons yielded 11,237 oz. of gold.

## 1910.

During 1910 the closing down of the Star of the East mine and the suspension of shaft-sinking by the Central Plateau Company gave a further setback to mining at Sebastopol. The Ballarat North Prospecting Company continued work at the 500-ft. level; rising and driving was also undertaken on the line of country in which the rich patch was met with at the level above, but nothing payable was located. At the Kohinoor mine the water had to be overcome if operations were to be continued, and a set of 14-in. lifts was placed in the shaft. Meanwhile a cross-cut easterly from the face of the north drive at the 584ft. level was put in, but nothing of consequence was located. At the Sebastopol Plateau No. 1 prospecting in the shallow levels was carried on with some slight success towards the end of the year.

The year opened with better prospects at the Britannia United and the First Chance mines; at the former payable formations were located both on the "pith" line and to the east of the shaft at the 720-ft. level, while at the First Chance mine a formation 15 ft. wide and over 100 feet long was stoped on the Sulieman line. Unfortunately the improvement was not maintained throughout the year; the rich vein in the Woah Hawp Canton being exhausted and the other veins which were located proving poor, the yield fell away towards the end of the year. Shaft-sinking was continued to a depth of 1,200 feet.

The Victoria United Company ceased to pay dividends about the middle of the year after distributing to date £51,000. At the 1,400-ft. level the continuation of the formation that had been payable was cut at 50 feet from the shaft at the 1,300-ft. level, but proved disappointing, as did also the north drive on the Duchess slates. The principal supply of ore was won at the 1,215-ft. level, but the value fell to a little over 5 dwt. to the ton by the end of the year. The results from the Llanberris No. 1 Company were not up to the average and calls had to be made for carrying on the work. Prospecting at the 1,330-ft. level opened up a fair body of payable quartz, while the upper levels provided the bulk of the crushing material. The Last Chance devoted most of its attention to the stopes over the 800-ft. level, but met with indifferent results. The New Normanby Company continued to pay small dividends and to conduct vigorous prospecting at six levels to a depth of 1,500 feet. The total dividends paid to date amounted to £36,000. Some rich ore and several nuggets from the Indicator veins at 840 feet enabled the North Woah Hawp again to pay dividends after an interval of two years. At the 950-ft. level and in the stopes above, the veins on the Indicator yielded well; payable stone was also located on the "7-ft. slates" at this level. At the Llanberris No. 2 and at the North Normanby, prospecting was continued chiefly by tributers; work at the former mine ceased after the shaft had been deepened a further 100 feet, making the total depth 1,150 feet. At the Reward mine work was confined to driving on the Indicator at the 677-ft. level and to cross-cutting west at 200 feet, but the results were not encouraging. The adjoining Indicator Company prospected to a depth of 572 feet. The Woah Hawp No. 1 Company continued prospecting. The Woah Hawp No. 2 resumed work during part of the year and located a small patch of nuggets, but soon afterwards operations ceased. The Woah Hawp Central also closed down after a career of about three years.

## 1911.

In 1911 the Central Plateau Company at No. 2 shaft resumed operations and opened out east for the Albion lode at the 600-ft. level. At the Sebastopol Plateau No. 1 cross-cutting at the 653-ft. level was undertaken, as well as the prospecting of spurs in the vicinity of the worked-out Phœnix reef. The flooded mines now became a serious menace to the Kohinoor, the only one of the group still at work. This mine managed to keep

the water down to the level of the cross-cut, but in the adjoining mine, and for a length of over 2 miles, the water-level stood about 100 feet higher; falls in the drives prevented a more rapid flow of water to the Kohinoor (Fig. 14). In September it was abandoned. Both the Ballarat North Prospecting Company and the Ballarat City Company closed down owing to the failure of their extensive prospecting operations: the former had cross-cut 1,355 feet and the latter 1,350 feet, but intersected no lode tracks.

At Ballarat East the greatest depreciation took place at the North Woah Hawp, which began the year under favorable conditions. The exhaustion of the Indicator veins above the 950-ft. level caused such a depreciation in the yield that a 1s. call was found necessary before the end of the year, although 3s. 6d. a share was paid in dividends during the first half of the year and a 6d. dividend during the last half. Operations from the New Normanby mine at a depth of 1,500 feet were in progress in this claim, and ore of fair

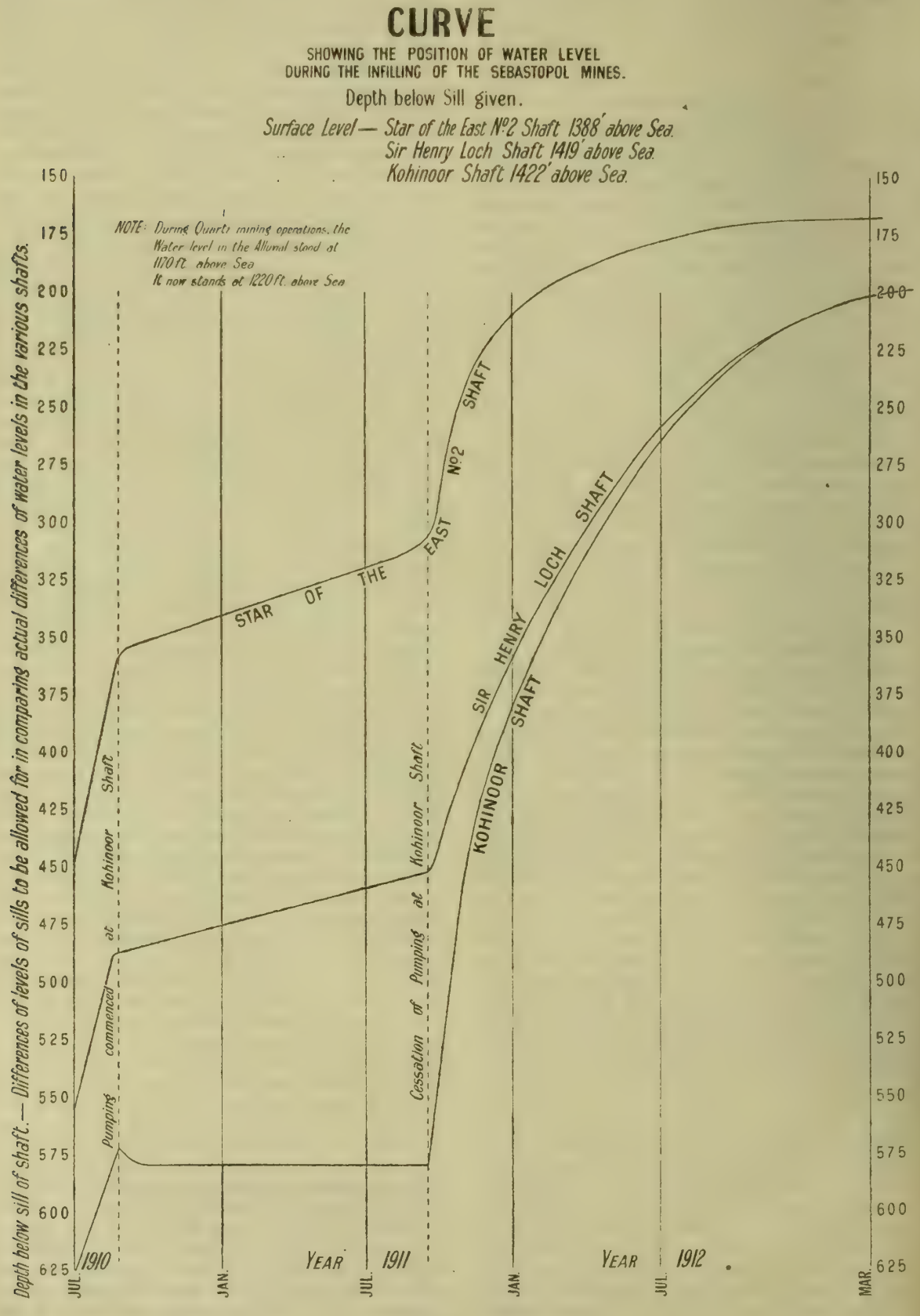



Fig. 14.

quality was produced. At the New Normanby a fair profit was made from quartz yielding under 5 dwt. to the ton. The Llanberris No. 1 Company after making two calls for the year was successful in locating payable stone at the northern end of the mine at the 830-ft. level, and was enabled to disburse 1s. 6d. per share during the latter part of the year; operations at the lower levels had not yet proved satisfactory. The Last Chance Company continued prospecting at the 800-ft. level in the vicinity of the Pug lode, and met with large bodies of low-grade stone. The First Chance Company having exhausted the bulk of the quartz in sight, continued a little prospecting on the Sulieman lode, and worked small veins to the east of the shaft. The average yield of the ore crushed by the Victoria United continued to be nearly 6 dwt. to the ton, but the tonnage was smaller and no profit resulted. The shaft was sunk to 1,500 feet and a west cross-cut was put in which passed through some small but rich gold-bearing veins; this cross-cut was driven 31 feet a week, easily a record for Ballarat mining. The North Normanby after erecting additional stampers found that the large lodes exposed in the mine were not profitable and the company was wound up. At the Reward and the New Indicator mines prospecting was unsuccessful and operations ceased.

## 1912.

In 1912 the only mining at Sebastopol was carried on at the Sebastopol Plateau No. 1 and at the Central Plateau. The 900-ft. level of the former was unwatered and the upper levels were abandoned. Prospecting was begun along the old north drive and also, with State assistance, on the Prince of Wales or Albion lode. At the Central Plateau No. 2 shaft payable quartz was located on the Albion lode, and stoping was commenced; the yield was 776 oz. from 1,725 tons.

Mining at Ballarat East was now entering a period of depression. At the Victoria United work at the 1,500-ft. level was suspended; tributers working at the 1,200-ft. level won nearly half the total output for the year, their average return being over 5 dwt. of gold per ton, but the company's average was under 4 dwt. The Llanberris No. 1 Company again made calls. The Last Chance was not successful in locating payable stone. The First Chance Company was wound up. The North Woah Hawp Company paid one dividend of 6d. and made two calls amounting to 9d. Good ore was obtained from the level driven from the New Normanby mine, but the stone at the 1,375-ft. level was just about payable. The total dividends paid to date by this company amounted to £52,650. The value of the ore crushed by the New Normanby improved slightly towards the end of the year, the quartz mined at the 1,500-ft. level being responsible for the change. The Woah Hawp Canton Company equipped the old Corn Exchange shaft with a plant to form its No. 2 shaft; meanwhile prospecting was in progress from the main shaft in the direction of the South Woah Hawp shaft.

## 1913.

The location of payable stone on the Albion lode by the Central Plateau was followed in 1913 by the formation of two companies to prospect the extension of the line. One of these, the North Central Plateau, began boring operations for the purpose of selecting a shaft site, while the other, the Central Plateau Extended, having shallow ground in its area, began sinking, and by the end of the year it had attained a depth of 600 feet. At the parent mine the shaft was sunk to 800 feet. At 700 feet the lode-track was intersected and driven on northerly, and a connexion made with the level above opened up a large formation which gave payable results. At the Sebastopol Plateau No. 1 prospecting on the Prince of Wales lode was unsuccessful; the 1,000-ft. level was unwatered, and further prospecting on and above this level in the large lode-formations disclosed nothing of value, and about the end of the year the mine was abandoned.

Very little activity was shown by the Ballarat East mines for the year. The New Normanby Company sank its shaft to 1,600 feet, the deepest on the line, and 2s. 9d. per share was called up. The North Woah Hawp Company called up 2s. 6d. per share and continued prospecting at various levels with poor results. The Last Chance did not improve and the Woah Hawp Canton Company suspended operations at both shafts. The Victoria United by increasing its tonnage of ore crushed was enabled to hold its own, but made no profit. A large body of quartz was opened up in the northern part of the mine, but the quality was poor. The Llanberris No. 1 Company was the only dividend-paying mine on the line, a large body of payable stone being opened up south of the cross-cuts at the 1,030-ft. and 1,130-ft. levels, For the year, 23,991 tons yielded 6,367 oz. of gold and £3,600 was paid in dividends.

## 1914.

In 1914, the Central Plateau Company, driving at the 700-ft. level along the track of the Albion lode to the big cross-course failed to locate any larger or more auriferous shoot; on the north side of the cross-course the lode was located, but was small. At the 600-ft. level a drive south on the main lode-track gave better prospects in some places. The stopes between the 600-ft. and 700-ft. levels supplied sufficient ore to keep the battery at work until July and to yield a small profit. The Central Plateau Extended Company was engaged in cross-cutting east and west at a depth of 600 feet, but for 270 feet east and 170 feet west no lode-track was located. The North Central Plateau Company sank its shaft to 80 feet, but at that depth a heavy flow of water was struck in vesicular basalt and sinking ceased.

At Ballarat East the Llanberris No. 1 Company held the first place and occasionally paid dividends. The quartz opened up at the Victoria United proved poor, and the mine was let on tribute. At the 1,500-ft. level, which had been abandoned for two years, payable stone was located and improved prospects resulted from operations in the northern part of the mine. The Britannia Company, the shaft of which was deepened during the previous year, continued the west cross-cut at the 1,180-ft. level and connected with the winze workings which had been carried out in 1898. In the cross-cut several gold-bearing veins were located. No change took place in the Last Chance mine, operations being confined to the 800-ft. and shallower levels. The North Woah Hawp shaft was deepened to 1,500 feet and a vein carrying rough gold was found on the "7-ft. slate" east of the shaft. The New Normanby Company located the lode at the 1,600-ft.

level and extended a drive south on its course. The Woah Hawp No. 1 obtained some payable stone on the Indicator at a depth of 1,000 feet.

## 1915.

The shortage of men caused by the Great War restricted prospecting operations, especially in the tribute workings of the Ballarat East mines. The Victoria United Company, after sinking the shaft and cross-cutting west at a depth of 1,605 feet, suspended operations at the end of the year. The Britannia United and Last Chance Companies continued prospecting, the former at a depth of 1,189 feet, and the latter above the 789-ft. level. The Llanberris No. 1 Company nearly exhausted proved ore reserves, and had no new developments in sight. Large bodies of barely payable quartz were exposed in the deepest level of the New Normanby Company's mine. The North Woah Hawp Company continued to prospect the Indicator veins, with occasional encouraging results, the deep levels showing ore of fair value.

At Sebastopol the Central Plateau Extended Company carried out systematic but unsuccessful prospecting, and closed down after cross-cutting nearly 1,000 feet. The Central Plateau Company continued prospecting at the 900-ft. level without success.

## 1916.

Mining suffered still more severely during the year. The Woah Hawp Canton Company closed down after prospecting and working quartz veins on the Indicator to a depth of 570 feet at No. 2 shaft. The New Normanby Company, whose workings were the deepest on the Ballarat East (1,590 feet), also ceased work. This led to the flooding of the lowest level of the North Woah Hawp mine. The Woah Hawp No. 1 Company ceased operations, and dismantled the plant. The situation at the Llanberris No. 1 Company did not improve. The Central Plateau Company continued prospecting at No. 2 shaft.

## 1917.

The closing down and consequent flooding of the Victoria United mine caused a heavy flow of water in the Britannia United mine, where the lower levels, in which a limited amount of low-grade ore was available, had to be abandoned. A similar fate befell the North Woah Hawp Company, but operations were continued in both mines at shallower levels throughout the year. The Llanberris No. 1 Company, after prospecting south of the main crosscut at the 1,228-ft. level, abandoned the claim, where continuous operations had been carried on for over sixty years. The Last Chance Company, after five years' prospecting at and above the 789-ft. level with only moderate results, ceased work as the flooding of the Llanberris No. 1 mine on the south and the Britannia United mine on the north would soon make operations impracticable, except at the cost of remodelling the plant, which prospects at the working level did not warrant. At Sebastopol, the Central Plateau Company continued driving on the Albion lode country, but the quartz did not improve in size or value.

## 1918.

Early in 1918 the Britannia Company, after fossicking in the shallow levels, ceased operations, leaving the North Woah Hawp the only mine working in Ballarat East, and, at this mine, as the levels were flooded by the rising water, the various mining material was taken out. Operations were confined to the removal of blocks of ore in the vicinity of the shaft which paid for breaking, but left nothing to provide for the baling of the incoming water. Prospecting on the Indicator was carried on at the 840-ft. level without success. The Central Plateau Company ceased work at No. 2 shaft; and with the closing down of this mine, operations ended at Sebastopol. On the Albion line of lode a length of over 1,350 feet was driven, and only one short shoot of payable quartz was intersected, which was stoped out before the mine closed down.

# GEOLOGY.

## THE ORDOVICIAN STRATA.

The strata forming the bedrock of the Ballarat field have been provisionally classed as Ordovician, though whether they lie high or low in the series cannot be settled owing to the almost entire absence of recognisable fossils. During the present survey a solitary graptolite was obtained in Cobbler's Gully, within two chains of Trenfield's battery. Graptolites and crustacean remains were obtained from the Great Leviathan shaft to the south of Sebastopol, from Winter's Freehold Nos. 1 and 2 shafts to the west, and from the 600-ft. level in the Star of the East No. 2 shaft in black slate. These were submitted to Dr. T. S. Hall for examination. A very careful search for fossils was made by Mr. W. H. Ferguson and a large number of specimens was gathered; from these Dr. Hall picked out 61 of the most promising in the hope that on closer examination they would afford some reliable data for determining the age of the rocks. He thinks[1] from the Phyllopods, which appear to resemble those of known Ordovician age from elsewhere in Victoria, that the horizon is probably Lower Ordovician, but he does not see his way to go further. Specimens from the Lady Mary mine, Ballarat East, contained phyllopod crustacea and sponge spicules; from the Bonshaw mine, phyllopod crustacea and a brachiopod; from the New Imperial mine, Black Lead, a graptolite (?); from Winter's Freehold No. 2 mine, Sebastopol, phyllopod crustacea, and from Winter's Freehold No. 1 mine phyllopod crustacea and long straight sponge spicules. The localities where palæozoic fossils have been found nearest to the Ballarat goldfield are in the parish of Bullarook to the south of Mt. Kooroocheang (16 miles N.N.E. of Ballarat) and on the River Leigh (10 miles S.S.E. of Ballarat). These appear to be on approximately the same belt of country, the northern extension of which passes along the eastern watershed of Joyce's Creek. West of this fossiliferous belt no fossil localities have been found, excepting near Maryborough (about 35 miles N.N.W. of Ballarat) and northwards. Lithologically, the strata are similar to the typical Ordovician beds exposed at the various goldfields of the State, such as Bendigo, Castlemaine, Daylesford, &c., and in the absence of contrary evidence, they may also be provisionally classed as Ordovician.

The bedrock of the field consists of alternating beds of sandstone and slate of various widths, but of a uniform fine texture. At Ballarat East the beds are for the most part thin; at Ballarat West they are much thicker. Indicators or guides whereby the miner is enabled to follow and locate the richer portions of quartz spurs intersecting the beds have long been recognised at Ballarat East. A prominent feature in the structure of the whole field is the corrugation or folding of the beds. Though there are local exceptions, the synclines and anticlines are in general more symmetrical in the Ballarat West belt than in the Ballarat East belt, where acute and unsymmetrical folding is noticeable.

Structurally, the bedrock consists of a series of highly crumpled strata, which are brought to the surface at close intervals, so that the total thickness of the outcropping strata amounts to less than one-fifth of their surface extent. Dynamic metamorphism has produced fissuring in the sandstones and cleavage in the slates, but it is not as apparent as might be expected in rocks of such antiquity. Faults are frequent though they are usually of minor importance only. The dykes and quartz lodes in the Ordovician strata are dealt with under their respective headings.

Two groups of dykes intersect the strata, one parallel and the other transverse to the strike.

[1] Rec. Geol. Surv. Vict., Vol. III., Part 2 p. 206.

## DETRITAL DEPOSITS.

### HIGH LEVEL GRAVELS.

The oldest alluvial deposits in the Ballarat district are now represented by a few scattered remnants on the crest of the range east of Ballarat; these are the vestiges of what was probably an extensive deposit prior to the dissection of the peneplain. They are found along the range to the south-west of Warrenheip, not on the highest points but frequently in saddles at an altitude of from 1,700 feet to 1,800 feet above sea-level. The deposits consist of quartz boulders and pebbles, usually fairly well rounded and, in places, cemented with siliceous, clayey or ferruginous matter.

At a considerably lower level and within the confines of the surveyed area, remnants of a probably later deposit are met with, e.g., on Clayton's Hill, Pennyweight Hill, and on the flank of Mt. Pleasant at Golden Point. This deposit is 1,430 feet to 1,460 feet above sea-level, and is probably contemporaneous with the extensive subbasaltic "reef-washes" underlying Sebastopol plateau which were found at an altitude of 1,150 feet above sea-level in the Band and Albion Company's claim. It consists of well waterworn pebbles and boulders of quartz—the latter sometimes of enormous size—with rarer fragments of the harder slates and sandstones packed in layers with fine sand; fragments of well waterworn siliceous cement—a denuded formation—are also met with and a ferruginous cement in layers is found in places, as for instance at the Sir William Don and the Band and Albion mines. Of the origin of these formations little can be conjectured. Murray[1]: "Marine action on gradually rising ground was the principal force which disintegrated, rounded and deposited the fragments composing the drift" which "spread almost uninterruptedly from the Warrenheip Range to Pennyweight and Clayton's Hills," and "from Ballarat southward to Shelford." Johnson, in an unpublished manuscript report, regards the deposits as due originally to glacial action prior to the formation of the drifts which were deposited and arranged by waters issuing from the melting ice. Serjeant,[2] whose acquaintance with the deposits was most intimate, favored a marine origin for the reef-washes, which he stated "had no defined channel" and varied in depth from 1 ft. 6 in. to 6 ft. in the Band and Albion Consols mine.

These gravels have been largely worked for gold both where exposed and where covered by basalt, &c., and, in places, they have proved very rich (*see* Park, p. 92, Ballarat Freehold, p. 75, Hurdsfield, p. 87, Webster Street, p. 100, Lady Don, p. 90, &c).

[1] Geology and Mineral Resources of Ballarat. Prog. Rept. Geol. Surv. Vict., Vol. I. p. 68.

[2] Progress Report of the Royal Commission on Gold Mining, 1891, p. 533.

THE DEEP LEADS.

Still younger than the reef-washes are the "deep leads" of the alluvial miners. As to the period of time which elapsed between the deposition of the high-level gravels and the deep leads, little, if any, information is available. In the vicinity of Clayton's and Pennyweight Hills, the beds of the leads are 200 feet lower than the high-level gravels; at Golden Point the difference is 230 feet and at Redan about 200 feet. In some places the alluvial deposits were continuous from the deepest point of the gutter to the high-level gravels, but in other places the deposits were quite distinct, the high-level gravels forming one or more terraces (see Sir William Don mine, p. 96, Winter's Freehold,* at various heights above the main lead. Further, some of the terraces do not belong to the high-level gravel period at all, but are merely the residual portions of the bed of the stream which remained while the valley was being deepened. Thus were found some areas covered by clayey or sandy drifts or by "headings," such as might be left by a casual flood. The denudation and redistribution of the older and richer drifts left deposits with erratic and varying gold values and also caused similar changes in value in the deep leads.

The deep leads varied considerably in width, nature of contents, values, &c. The main lead of the Ballarat goldfield was undoubtedly the Golden Point lead, which was formed by the confluence of the Canadian, the Eureka, the Old Gravel Pits, and the Bakery Hill leads and their branches; lower down it was joined from the east by the Waterloo, the Nightingale, the Malakoff, Milkmaid's, the Redan and the Miner's Right leads, but practically no branches of any size entered it from the west (*see* Fig. 11, p. 19).

As far down as the Band and Albion No. 3 shaft, the course of the Golden Point lead is quite clear, but there has been much discussion concerning its direction below this point. Two widely-divergent views are held—one that it turns west and the other that it continues in a southerly direction.

In favour of the suggested westward trend of the lead, it has been pointed out that mining operations at the Band and Albion No. 3 shaft proved that the surface of the bedrock, which is covered with a wide poor alluvial deposit, dipped westward.

In support of the other opinion, that the lead trended southwards, it was held by some that the old lead would conform to the course of the Yarrowee (clearly a marginal stream) and that the southerly trend both of Frenchman's lead in the Nelson mine and of the lead in the Prince of Wales mine confirmed this view. There can be little doubt that the distribution of the richer mines led the miners and surveyors to believe in the southerly outlet, especially while the system of frontage claims was in force, rather than in the western outlet, since the wash was poor in that direction, and moreover, it headed towards freehold property where mining could be carried on only at considerable expense. Murray, after investigating the matter in 1870, decided in favour of the southern outlet.

Plans of the mine workings show, however, that the level of the bed-rock on the boundary of Winter's Freehold is 12 feet below that at the Band and Albion No. 3 shaft and 20 feet below that of the lead in the southern part of the same mine. Moreover, the bottom of the St. George No. 2 shaft, which bottomed in the gutter, was 27 feet above the gutter at the Band and Albion No. 3 shaft; if the lead had trended southwards, the bed-rock at the St. George No. 2 shaft should have been 37 feet deeper than it is, since the fall of the Golden Point lead is nearly 60 feet per mile as far as the Band and Albion No. 3 shaft.

The leads proved in Winter's Freehold trended south, but they do not appear to have a bearing on the question at issue; the workings from Winter's shaft, except for one short southerly drive, lay northwards in the vicinity of high ground and reef-wash.

In 1890 and 1891 a series of diamond drill bores was put down westwards from Winter's Freehold and sufficient evidence was obtained to lend strong support to the theory of a western outlet to the Golden Point lead, although the deepest ground was not located.[1]

The Frenchman's lead after a north-westerly course of over 2 miles turns sharply south and forms the head of a south-trending lead, the distinctive features of which are steep banks and a narrow bed with only small areas of reef-wash on the banks. This contrasts strongly with the Golden Point channel north from the Band and Albion Company's No. 3 shaft. Throughout the Prince of Wales mine the steep-banked, narrow channel continued, but in the Bonshaw, the Great Gulf and the Leviathan mines a broad field of wash with no definite channel was encountered. * In the Franklin mine a steep rocky channel was proved and from this point the deep lead workings were continuous to below Grenville but the deposits were of small importance compared with those in the vicinity of Ballarat West.

The course taken by the Golden Point lead and its tributaries in the upper portions is markedly sinuous. The Canadian lead trends northerly and receives tributaries from the adjacent slopes; those from the eastern side are the largest and tend to deflect the main channel to the west. Where the Gravel Pits and Bakery Hill leads come in from the north, the lead turns westward, heading for the "bed-rock" outcrop under the Fire Brigade station in Sturt-street; but, after following this direction for a short distance, it turns south-westerly to the Band and Albion No. 3 shaft, where the lead again turned west as already explained.

The lead, where first worked under the basalt, was very narrow and yielded little more than wages as far as the Cosmopolitan mine, but in this mine an enrichment was noticeable and good returns were obtained. A similar feature was noticeable in the tributary leads, which were narrow and had a steep westerly fall. The yields from the Nightingale and Malakoff leads were small, but the Milkmaid's and Redan leads (*see* Burra Burra Company, p. 81, and Golden Gate Company, p. 85) were rich after entering the line of strike of the bed-rock at the Cosmopolitan; the same feature was traceable throughout the other leads to the south, e.g., the Woolshed, the White Horse, and the Frenchman's, and also to the north, in the Inkerman lead, where the lead was unpayable east of this line, but rich westwards (*see* p. 72).

The Inkerman lead was traced from the north of Black Hill in a general south-westerly direction; it passes eastwards and southwards around

* The Ballarat West Leads *in press*.

[1] Annual Rept. Sec. for Mines, 1892.

the margin of Lake Wendouree and has a general westerly course under the southern shore of the lake where last worked.

Further details of the various leads will be found under the separate headings (pp. 69-73); also in the description of the mine workings (pp. 74-102), and the positions of the leads are shown on plan. (Pl. I.)

The eruption of the basalt probably began while the deep leads were still cutting out their channels. The effect of the various flows cannot be investigated in detail, but the deposits formed in the lakes which resulted from the damming back of the watercourses (*see* Figs. 3, 4, 5) will be described in the next section.

### NEWER GRAVELS.

After the basalt eruptions had ceased, a series of lakes was soon formed. The chief of these, near Ballarat, probably covered the greater part of the flat in the vicinity of Main-street as far as the town boundary of Ballarat East, and extended along the 1,405-ft. contour (*see* Fig. 4). Deposits were formed along the edge of the lake; a remnant upwards of 10 feet thick and composed of layers of coloured clays and some gravel overlies the basalt along the eastern side of Lydiard-street. Mottled clays, usually red and white, are typical of these deposits. Throughout the clays are layers of gravel, commonly angular hill-wash, but in places re-deposited portions of the older rounded gravels. On the slopes formed of Ordovician rocks (*e.g.*, Black Hill, Golden Point, the east and west side of White Horse Range, and the eastern side of the main road) the existence and position of the newer drifts can be readily accounted for; but the isolated patch on the basalt east of Lydiard-street, from near Mair-street to the School of Mines, is more difficult to explain, and can only be accounted for by the whole area of the lake behind the basalt flow being filled to the level of the overflow with a deposit which was afterwards almost entirely removed. Gnarr Creek, the marginal creek flowing from the north-west, may have supplied some of the clays and gravel, but their distribution for a distance of about half-a-mile along a sloping bank is otherwise difficult to explain.

The remains of contemporaneous deposits formed in the deeper parts of the lakes and covering the deep leads were pierced by the alluvial shafts on Gum Tree Flat, and were found to consist of layers of clay and drift with much decomposed wood, the total thickness being upwards of 150 feet.

Similar conditions existed over the other leads at the points marked B, C, D, E, F, G (Fig. 4).

With the erosion of the Yarrowee Creek to near its present level, portions of the newer gravels were removed and the final stages of siltation and deposition may be included under the heading of Recent Deposits.

### RECENT DEPOSITS.

Over the whole area surveyed, layers of clay and soil, together with some gravel and sand, occur along the banks of the watercourses and also on the hill slopes, where they merge into the newer gravels in some places. On the surface of the basalt to the west, depressions have been filled in with several feet of clay, pisolitic iron ore (usually in grains), and soil, the concentration of decomposition products from the higher portions. On the river flats no line of demarcation can be drawn between the recent deposits and the newer gravel series, except where denudation has removed portion of the latter and has left the recent deposits at a lower level. On the Gum Tree Flat, where such information was once available, the levelling off of old mullock heaps, the piling up of sand and sludge dams, and the erection of houses renders the correlation difficult.

The boundaries of the various formations so far as could be obtained from survey and previous plans, &c., are given on the locality plan (Pl. I).

## THE BASALTS.

Overlying the alluvial deposits of the deep leads beneath the Sebastopol Plateau are four distinct layers of basaltic rock. Following the nomenclature used by the miners, and also by Brough Smyth in his *Mineral Resources and Mining Districts of Victoria*, these layers or "rocks" are numbered from the surface in reverse order to their age, the upper layer being called the "first" and the lowest the "fourth rock." Within the area under notice, the greater part of the basalt exposed at the surface is the "first rock." In the valley of the Yarrowee Creek, and in part of its bed, the "second rock" is exposed. The "third and fourth rocks" are met with only in the deep channels and do not outcrop at the surface, in some places they are directly in contact with the bed-rock and in others they lie above the wash-dirt in the gutters or deep leads. Johnson, who had an intimate knowledge of the deep leads, states, in an unpublished manuscript, that what at times was taken to be decomposed basalt is, in his opinion, compressed volcanic ash and tuffs; but there can be but little doubt that solid basalt was met with in places on the wash or on the adjacent bed-rock. Separating the various flows are layers of drift, gravels and clays of various colours. At the St. George, the Swipes, the Mob, on the White Horse lead; and later at the Crescent, the Red Jacket, Alston and Weardale's and other places, gold was found in these drifts, but never in payable quantity. Lignite, or ligneous black clays, were usually found overlying the gravel in the deep leads, and the presence of these was regarded by the miners as a sure sign of deep ground. Trees standing erect, and partly charred by the encasing basalt, were found in the Defiance, the Prince of Wales, and Bath's mines.

The precise geological age of the basalts cannot be determined; they are, however, Tertiary and are younger than the deep lead deposits.

Many years ago it was suggested that Lake Wendouree occupied the site of an ancient crater, but this is improbable. A prominent mound to the west of the lake would appear to be the most likely source of at least two of the flows. The craters and volcanic hills known as Pisgah, Rowan, Clarke's, Warrenheip, and Buninyong have each contributed more or less to the basaltic outpourings beyond the confines of the area surveyed, but the lavas from these vents are not met with in any of the deep leads under notice. One striking feature lies in the relative elevation of the Warrenheip and Buninyong basalts above those of the Sebastopol Plateau; and in the absence of any indication of faulting subsequent to the basaltic outpouring, it appears as if the Clarke's Hill flow, on which Mt. Warrenheip is merely a scoria cone, was prevented from reaching the low-lying valley in the vicinity of Ballarat East by a north and south ridge (see p. 12), through which Gong Gong Creek has cut its channel.

The surface configuration of the Sebastopol Plateau basalt shows that the third and fourth rocks are confined to the channels of the deep leads and are younger than the extensive reef-washes which are situated higher than the third rock, but lower than the second rock.

The surface of the first rock is almost flat but it slopes gradually away from a small, low hillock, or mound, situated about 1 mile west of Lake Wendouree, and rising about 1,525 feet to 1,530 feet above sea-level. This appears to be a point of eruption. The greater portion of the lava from this vent seems to have flowed northerly and westerly, while a smaller quantity flowed southerly and easterly. Easterly, the flow divided before reaching the shallow ground in the vicinity of the show-yards, and in the bifurcation Lake Wendouree has been formed. No streams enter the lake, and little silt.ation has occurred. The southern edge of the lake is formed by a tongue of basalt, overlying the second rock that filled in the valley of the Inkerman lead. A ridge or partly buried spur of older rocks on the western side of Drummond-street, south of Sturt-street, is connected with the bed-rock outcrop east of Raglan-street. Over the ridge the basalt flowed, but the grade of the surface is noticeably steeper on the eastern than on the western side, where the fall is southerly. Near the Yarrowee Creek the basalt appears to have met the hill-wash and drifts on the shallow ground. The base of the "first rock" along the western side of the Yarrowee from Sturt-street southwards for half-a-mile is 1,385 feet above sea-level. In the shafts to the west along the Golden Point lead, on a line from the corner of South and Ascot streets to the corner of Sturt and Armstrong streets, the base of the rock is 25 feet lower. Further west, the base gradually falls as far as Pleasant-street, where the fall becomes southerly at a low angle, and the base continues level in a westerly direction. The westerly fall of the base is not parallel to the surface, and in consequence the flow thickens from 40 feet at the eastern side of Lydiard-street to 150 feet on the west side of Pleasant-street. The top of the rock at this point was about 1,495 feet above sea-level.

A layer of clay, which separates the first from the second rock, extends over the whole of the plateau. Near the eastern edge it includes some layers of drift, which are occasionally auriferous. This clay exhibits a variety of colours, and is more like a sedimentary deposit than basalt decomposed *in situ*. It contains in places carbonized remains of grass, but no traces of larger plants. In thickness the clays vary from 6 feet to 30 feet, averaging about 10 feet.

The second rock, which underlies practically the whole of Ballarat West and Sebastopol, was first met with in the shafts on the Golden Point lead at a point north of Bridge-street, and about 5

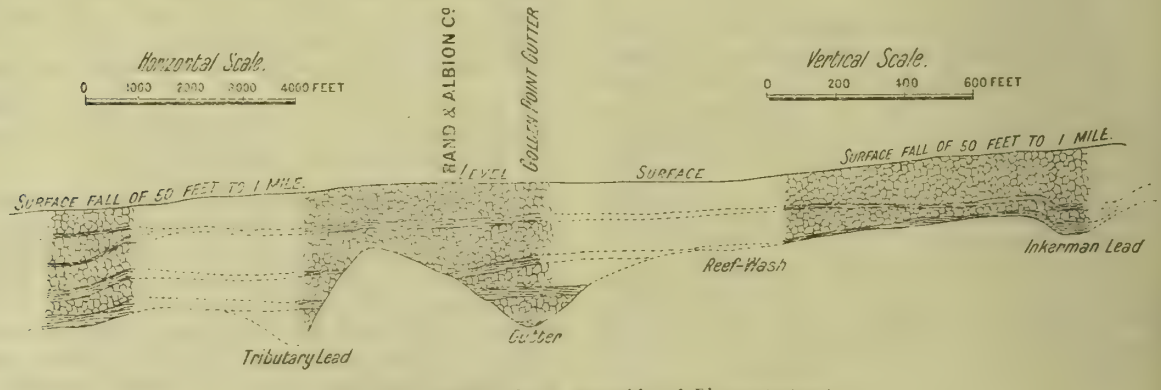



FIG. 15. Section along west side of Pleasant-street.

The fall of the surface from Lake Wendouree along Pleasant-street southerly to Hertford-street amounts to 100 feet in 2 miles, but the base of the "first rock" falls less than 30 feet, and then rises 10 feet in the next 30 chains to the Albion shaft (*see* Fig. 15); the surface of the last 30 chains is perfectly level. From the junction of Pleasant (Alfred) and Hertford streets, where the first rock in the Band and Albion No. 3 shaft (1,391 feet above sea level) is 90 feet thick, the surface falls easterly and the base rises towards the Yarrowee, the base overlying the Woolshed lead being 1,345 feet above sea level. Northwards the base of the first rock is at a similar altitude on the Miner's Right lead west of the Yarrowee, but on the eastern side of the creek the base is 12 feet higher, and a thickness of only 15 feet of the first rock is exposed on the crest of the hill east of the Star of the East mine. Southwards from the Albion shaft, the southerly fall of the surface is resumed, a fall of 80 feet in 1½ miles being noticeable before a steeper grade begins. For over a mile the base and surface of the first rock are parallel and the basalt is 80 feet thick, but beyond the Prince of Wales No. 1 shaft the rock gradually thins out and ends on the north side of the Bonshaw Creek. From the Woolshed lead southerly along the Yarrowee Creek, the base of the rock along the eastern edge of the plateau is from 1,335 feet to 1,290 feet above sea level. On the hill north of Terrible lead, east of the Yarrowee, the level of the base of a small residual patch of basalt is 1,347 feet above sea level, while at the White Horse lead the base is at 1,333 feet, and rests on clays, &c. On the hill south of the Pyrites Works the base of a layer of basalt 15 feet thick slopes in a southerly direction, and varies from 1,340 feet to 1,350 feet above sea level; this basalt rests upon Older Gravels. South of this point there are no basalts east of the Yarrowee within the surveyed block.

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The second rock, which underlies practically the whole of Ballarat West and Sebastopol, was first met with in the shafts on the Golden Point lead at a point north of Bridge-street, and about 5 chains west of Peel-street; the surface of the rock at this point is about 1,320 feet above sea level, and is 50 feet below the surface of the flat. The surface of the second rock varies between 1,350 feet at the corner of Dana and Armstrong streets, and 1,300 feet above sea level between the Albion shaft and the Band and Albion No. 3 shaft. Southerly from the Albion, the fall is to the south, the top of the second rock being 1,240 feet above sea level at the Prince of Wales No. 1

shaft. The layer ranged up to 90 feet in thickness where it rested on the third rock; but as it frequently overlay reef-washes or shallow ground, the full thickness was seldom developed. The bores recently put down by the North Central Plateau Company (see p. 193) passed through the rock in positions suitable for testing its full thickness.

Between the second and third rocks are layers of drift, gravel, sand, and clay, derived in part from the Older Gravels (reef-washes), the level of which was above the third rock. Over the "deep ground," these deposits were upwards of 30 feet thick, and contained much water.

The "third" rock was found only in the shafts on the deep leads, and was first met in the Golden Gate shaft on the Redan lead at the corner of Skipton and Cobden streets, at 1,188 feet above sea level; the basalt at this point was only 2 feet thick.[1] This rock was probably also sunk through in the Kohinoor Company's No. 2 shaft, but the record of strata of this shaft is vague. At the Great Extended No. 1 shaft, the third rock was 35 feet thick. From this point to the Band and Albion No. 3 shaft it sloped rapidly southwards, the levels of the top at these two shafts being 1,185 feet and 1,166 feet, and of the bottom 1,150 feet and 1,105 feet above sea level respectively. At the Saint's (or Band and Albion No. 4) shaft it was 40 feet, and at the Band of Hope and Albion No. 9 shaft 70 feet thick, the thickness in the Saint's (Band and Albion No. 4) shaft being the greatest mentioned in the old shaft records. The bores of the North Central Plateau passed through from 80 feet to 90 feet of this flow, the levels of the top and bottom being 1,175 feet and 1,085 feet respectively. Southwards, the fall amounts only to 16 feet in 1½ miles from the Albion shaft to the Prince of Wales No. 1 shaft, the thickness at the latter point being 68 feet.

Underlying the third rock a layer of drift about 30 feet thick was usually met with. This contained much water, and, lying at a depth of over 300 feet, it caused great trouble to the miners. At the St. George's company's shaft gold was found in this layer, but not in payable quantity, and at the Red Jacket mine a little fine gold was met with under similar conditions.

The fourth rock was regarded as having first been met with in the Golden Gate shaft, where 3 feet of basalt was found; however, the depth at which this basalt was found makes it highly probable that it was portion of the third rock.

In the Saint's shaft, the fourth rock was struck at 1,086 feet above sea-level (324 feet below sill). In the Band and Albion No. 3 shaft and the adjacent bores the surface of this rock was from 1,070 feet to 1,077 feet above sea-level, and the rock was 84 feet thick at the No. 3 shaft. At the diamond drill bore near the corner of Spencer and Vale streets, Sebastopol, the surface of the fourth rock is 1,074 ft. 6 in. above sea-level, and the layer is 71 feet thick. At the Prince of Wales No. 1 shaft the level of the top is 1,060 feet above sea-level, and the rock is 40 feet thick in the shaft, but the basalt in the gutter touched the bedrock in places. The base at this point is 974 feet above sea-level, making the rock 86 feet thick.

Summarizing the above, it is apparent that there have been four distinct flows of basalt, and that the point of origin of each flow has been to the north and west of the Band and Albion No. 3 shaft. Whether the four flows came from the same vent cannot be settled, but it seems probable that the third and fourth rocks came from the westward along the deep west-flowing channel past the Band and Albion No. 3 shaft[1] and filled up the valleys to the north. The small difference in surface-level between the Band and Albion No. 3 shaft and the diamond drill bore, 2 ft. 6 in. in 95 chains, suggests that the lava reached this point by a different course than did a south-flowing stream from the former point; and this applies also to the fourth rock, the surface level of which is parallel to the third rock. The upstream portions of the third and fourth rocks appear to have been but little denuded, as a thin, wedge-shaped layer of basalt was met with.

Lithologically, the basalts in the different flows vary considerably, the first rock being coarse-grained dolerite, while the second rock is dense, and contains crystals of olivine distributed throughout. Throughout the first rock vesicular steam cavities are plentiful, and sections of the flow as exposed in the Corporation quarry at Alfredton show that the vesicular cavities occur in layers separated by coarse-grained dolerite; this structure is found throughout the flow.

[1] In a section of the Homeward Bound mine (see p. 70) prepared by M. S. Davidson, a layer of basalt 50 feet thick, corresponding to the third flow, is given, but the section by Woods in Brough Smyth's *Goldfields and Mineral Industry of Victoria* (1869), omits this basalt. The sections given by Woods of shafts above and below the Homeward Bound are also wanting in this respect. The surface and bottom of the basalt quoted by Davidson are respectively 1,231 feet and 1,181 feet above sea-level.

## FAULTS.

The faults in the bedrock of the Ballarat goldfield may be classified as (A) faults parallel to the strike of the strata and known as slides, faults, "piths," "flucans," "digs"; and (B) faults transverse of the strike known as "crosscourses," "heads," &c. Group (A) may be further subdivided into (1) faults parallel to both strike and dip of the beds, e.g., "slides"; and (2) those agreeing in strike but not in dip with the beds, e.g., "faults" and "leatherjackets."

The "piths" of the Ballarat East mines are typical faults of the type (A, 1). They are slides with displacement usually most pronounced in a vertical direction. The relation between beds containing auriferous quartz veins on opposite walls of these "piths" is important in mining. Slides on which the amount of movement is not noticeable are common, and are known as "dig" or "pug" seams; they are usually very thin and seldom attain a width of ¼ inch.

The "pith" type of fault (A, 1) in its vertical extension merges into the next type (A, 2) for sooner or later it cuts across folded strata, and is no longer parallel to the bedding. For example the laminated lodes of Ballarat West occur on slipping planes in certain slates, but, on reaching the anticlines or synclines, the faults continue although the lodes do not. To take particular instances, the upper portion of the Consols lode in the Kohinoor and the lower portion in the Band and Loch, may be referred to; the folds themselves are displaced upwards about 50 feet.

The most common types of faults agree with the strata in strike but not in dip, and in all the mines examples of such faults occur. Although frequently irregular in dip when small, these faults are very regular when large. They are most conspicuous in the Ballarat East mines (where they are known as "leatherjackets" or "slides"), but they are by no means confined to the eastern part of the goldfield. The term leatherjacket appears to be derived from the leathery comminuted material found along the fault planes;

[1] This is suggested by R. A. F. Murray, *Prog. Rept. Geol. Surv. Vict.*, No. I., p. 69.

it resembles pressed potter's clay, and can be detached in sheets up to ¼ inch thick and several square feet in area. The leatherjackets commonly dip about 45° in a westerly direction, and in the deeper mines the faults seem to belong to a regularly recurring series. At Ballarat East the auriferous quartz formations, and in two instances dykes, "the sediment" and "the pug," occur in the leatherjackets, which appear to be older than the main ore bodies; in the mines at Ballarat West (e.g., the Star of the East and South Star mines) the leatherjacket type of fault appears to have been formed after the main lodes, but earlier than the spurs associated with the lodes.

Of the faults transverse to the strike, those known as crosscourses are conspicuous. They appear to be younger than the faults parallel to the strike. The main crosscourses, the position of which are shown on the plan, have a general north-easterly strike and are nearly vertical. As to their geological age no direct evidence is at present available, but Serjeant records "that the crosscourses extend upwards and through the basalt overlying the deep leads."[1] Such recent formation can hardly be reconciled with the features now observable, but a comparatively recent geological age may be described to them; and they may be regarded as probably having been formed immediately before the first eruption of Tertiary basalt in the locality. The amount of displacement along this series of faults is hard to fix definitely. The assumption that large blocks of strata have moved along the principal crosscourses, and that these blocks have been twisted and disturbed by irregular movements within themselves affords the most feasible explanation of the recorded discrepancies in the amount of shift at different parts of the one fault. It can be definitely stated that the displacements along the main crosscourses are all right-hand movements, which vary in amount from a few feet up to several hundred feet; at the Prince Regent crosscourse (No. 34 of Lidgey) the displacement is 612 feet. The largest movement noted during my survey was that on the First Chance (No. 9 of Lidgey), where the anticlinal axis is displaced 240 feet on the northern side. The amount of vertical displacement cannot be regarded as a satisfactory measure of the total movement, though it is usually given in the mines as the result of observations of the effects of the faults on veins, e.g., the Indicator series, but from the slickensides visible on all of the crosscourses at Ballarat East and Ballarat West, the movement is horizontal only. With regard to the Prince Regent crosscourse, the correlation of the Indicator on the south side with that on the north side cannot be denied, but it appears from evidence obtained on the same crosscourse in the South Star mine, where the displacement is 118 feet, that the Indicator, as worked on the south side of the crosscourse, may be on a fold to the west of the anticline upon which the Indicator on the north side has been worked. The effect of unequal compression on either side of the crosscourse must not be lost sight of, but it seems improbable that the amount of faulting could diminish from 612 feet to 118 feet in the comparatively short distance of 6,500 feet between the Prince Regent and the South Star mines; the same displacement (118 feet) occurs on the Guiding Star and Albion lodes 1,300 feet and 2,600 feet to the west.

Another series of faults crossing the strata may be referred to in connexion with the basic dykes; for example, those in the New Normanby and Victoria United mines. The strike of these faults is nearly east and west, and the horizontal displacement along them is small. These faults appear to be closely associated with the period of volcanic eruptions; the western extension of the New Normanby dyke, however, seems to run beneath the Redan lead, which is older than the earliest basalt flows, and the dyke, or at any rate the fault, would therefore seem to be older than the lead or the lava flows.

There is also some physiographic evidence in favor of the fairly recent age of at least one crosscourse. The Eureka lead, which represents the original position of the Yarrowee Creek, follows the strike of a crosscourse (No. 11 of Lidgey), and streams from the north flowed into the main channel. The present Yarrowee Creek, which also conforms to the strike of a crosscourse (No. 6) has diverted the south-flowing branches of the former stream. The new channel has cut through bedrock instead of forming as a marginal stream through the comparatively soft gravels and clays with which the ancient channel was filled when the basalt flows dammed back the water and converted it into a lake. Such a diversion along what appears to be a more difficult course can be reasonably accounted for only by denudation along a comparatively recent crosscourse. Further evidence in this direction may be deduced from the altitude of the drifts on the north side of the Yarrowee, at the mouth of Cockatoo Gully and along the Little Bendigo Creek, where drifts of 30 feet or more in thickness are exposed; these drifts appear to correspond with the uppermost layers overlying the Eureka deep lead. It must also be remembered that this crosscourse is filled with a basic dyke in the Victoria United mine and that the basic dykes are of comparatively recent age.

After mining operations had ceased for some time in the Star of the East mine, a movement amounting to 1 foot was noted in the workings on the northern side of a crosscourse. This movement was in a horizontal direction, and agreed with the throw of the crosscourse. A movement of several inches along the bedding planes had taken place during the four years which have elapsed since work ceased in the cross-cut west at a depth of 1,500 feet in the New Normanby mine; as this cross-cut is the deepest in Ballarat East, and as no stopes had been opened at this level when the movement was noted, the movement cannot be attributed to mining operations. This movement was vertical, but whether in a normal or reversed direction was not ascertainable. In many of the mines evidence of motion was noticeable, but the presence of lower levels or stoped ground in the vicinity rendered other explanations as possible, while not likely, but the two cases cited above tend to show that movements within the strata are still in progress, and the amount of motion is such that can be readily ascertained.

## DYKES.

Intersecting the bedrock of the Ballarat goldfield are a number of dykes which vary widely in composition. Broadly, these fall into two groups:—(A) The more acidic series which run north and south, parallel to the strike of the strata, and (B) A basic series which crosses the strata and runs nearly east and west. The north and south series is probably the older; actual proofs from intersections are not available.

[1] *Quart. Rept. Min. Registrar, March 31st*, 1887.

but the north and south dykes are either contemporaneous with or earlier than the quartz reefs, and the basic dykes are more recent than the quartz reefs.

ACIDIC DYKES.

A large porphyritic dyke up to 25 ft. wide has been traced north and south for over 3 miles in the mines of Ballarat West. The most northerly point is that recorded by Murray at the corner of Sturt and Ripon streets, near the Inkerman lead. Wood[1] states that in the bedrock of the Prince of Wales mine there is a well defined "fault," composed of soft granite or the like. This is at the southern end of the line. To the north of this point, fragments of the dyke are common on the mullock heaps of the Working Miners No. 1 shaft, the Band and Albion Consols Nos. 1 and 3 shafts and the Kohinoor No. 2 shaft. In the Band and Albion No. 4 shaft (see p. 78), a section of which is given by Murray[2], the dyke was cut in the shaft. At deeper levels this dyke has been intersected by a cross-cut west of the Band and Loch No. 9 shaft; in the 1,250-ft. cross-cut of the Northern Star; in the 600-ft., 1,100-ft., and 1,500-ft. levels of the Star of the East No. 2 shaft; in a westerly cross-cut at the 860-ft. level, Central Plateau mine, and at 1,925 feet west of the Sebastopol Plateau No. 1 shaft. These points lie on a remarkably straight line and the existence of a continuous dyke may be considered certain. It averages 20-ft. wide wherever intersected. Hand-samples consist of a light-colored ground mass with porphyritic white to yellowish felspar crystals, and numerous corroded quartz crystals, double pyramidal in shape. Traces of mica and molybdenite, scattered iron and copper pyrites, and rarely galena were observed in the rock. Assays usually gave a trace of gold. Even in samples from the alluvial drives, the character of the dyke is distinctly visible, the felspars being but little altered. The strike of the dyke is N.1° E. to N.5° E. and the dip as seen in the Star of the East mine is slightly to the east.

Parallel to this dyke, but markedly different in appearance, are two dykes, known in the Ballarat East mines as the "Pug" and the "Sediment," since they are decomposed to a plastic clay in the shallow levels. These dykes generally strike N. 3° W. to N. 5° E. and dip on the average 45° W. like the leatherjacket faults. Although apparently closely connected with such faults, the dykes occasionally break through the adjacent strata and assume a vertical course. This is noticeable in the 500-ft. and 600-ft. levels of the Last Chance mine. They are seldom more than 2-ft. in thickness, and traced longitudinally they appear to be lenticular. The southern limit of the Sediment, which was well developed in the Sulieman Pasha mine[3] appears to lie 60 feet south of cross-course No. 9, west of the First Chance shaft. The "Pug" extends from the New Normanby mine to the Victoria United mine, a distance of 1¼ miles, and is noticeable in all the upper workings, but at a depth, it is not continuous and appears to cut out at about 800 feet from the surface. That a downward continuation exists there can be no doubt, but so far this has not been observed in the mine. South of cross-course No. 34 a similar dyke is met with in the Indicator and Reward mines: this dyke although in part associated with a leatherjacket, cuts across the strata almost vertically in some parts of its course. At the Woah Hawp No. 1 mine a dyke of the same composition is met with at the 1,100-ft. level (see p. 249). A similar dyke shows in the shallow shafts near by, and in the gully to the north of the Ballarat East Prospecting mine, York street. Hand-samples of the less decomposed portion of the dyke consist of a white or yellowish fine-grained ground mass, through which are scattered small felspar crystals, but no quartz as an original constituent was noticed. Scattered crystals of pyrites occasionally occur in portions of the dyke, and small veins of dolomite are frequent.

Dykes of this type appear to be of the same age as the quartz lodes associated with them; at least, there is direct evidence that the quartz is in part older and in part younger than the dyke, for the dyke in some places intersects, and in others is intersected by the quartz veins. Neither the Pug nor Sediment appears to have affected gold deposition.

Another and closely-allied type of dyke is exposed at the Yorkshire Reef workings. This dyke strikes nearly north and south and ranges from a few feet up to 30-ft. wide. Owing to the decomposed state of the whole dyke, its original character can only be inferred; it was probably a quartzless felsite. At the surface it decomposes to a white kaolin through which are disseminated fine quartz grains. At a depth, e.g. Watson's adit, the material is slightly discoloured with iron stains and contains portions of country rock. Northwards in a section exposed in a gully, masses of adjacent strata are included in the dyke. Further north the dyke changes in appearance and seems to die out; southwards it is not traceable beyond a small gully and it appears to die out also in this direction. The total distance over which it has been traced is 1½ miles. Auriferous quartz spurs are reported to have been worked in this dyke at the surface, but whether they actually penetrated the dyke or were included in masses of country rock cannot be determined. Southwards along the continuation of this line, a similar dyke is said to have been met with in the workings of the Exchange mine.

West of the Yorkshire dyke, in Cockatoo Gully, is a small dyke about 6 feet in length, consisting of a highly micaceous felspathic ground-mass, with nodules of vitreous, roughly crystalline quartz up to 1 inch in diameter.

Another type of dyke occurs in the mines towards the southern end of the Ballarat East field. In the 1,200-ft. level of the Woah Hawp No. 1 mine is a dyke, apparently a diorite, striking north and south. Samples of this dyke occur on the dumps of Little's Defiance and the Dalzell Buchanan shafts.

BASIC DYKES.

The basic dykes are younger than the acidic dykes and have a general east and west course. They are usually only 2 or 3 ft. wide. Dykes of this type were not observed in the western mines; they appear to be confined to the eastern group of mines, and are probably more extensively developed still further east. In the Victoria United mine three such dykes occur at 240 feet, 760 feet, and 900 feet north of the shaft respectively. In the New Normanby mine, at the 1,200-ft. level and 540 feet south of the shaft, there is a similar type of dyke; portion of this dyke is fractured and the crevices or vughs are lined with crystals of various mixed carbonates among which aragonite crystals are frequent. In the shallower levels,

[1] Brough Smyth's *Goldfields and Mineral Districts of Victoria*, 1869, p. 504.
[2] *Progress Report, Geological Survey*, No. 1, p. 77.
[3] See Lidgey's section in his report on the Ballarat East Goldfield.

these dykes are decomposed and are known to the miners as "clay banks." They appear to be younger than the crosscourses along which they are formed. On account of their small size, surface exposures are easily obscured, but an east and west outcrop from 2 ft. to 3 ft. wide was noticed in the dredged area of the Bendigo and Castlemaine Company on the Little Bendigo Creek, about 12 chains north of Yarrowee Creek; this dyke had decomposed to a clay (see Appendix). About ¼ mile east of this exposure a decomposed dyke 9 in. wide shows near the crest of a steep bluff of rock overlooking the Yarrowee Creek and 15 chains still further east, a decomposed dyke in a small gully north-west of the Brown Hill Hotel and on the north side of the creek, appears to be a bulge on the same line. No determinable samples could be obtained, but a noticeable feature was the salinity of a spring that occurs on the contact; for analysis of the water (see Appendix).

Further east, what appears to have been a large basaltic dyke was found in the workings of the Eclipse All Company in 1866; this company while searching for alluvial at the head of Golden Gully, found a layer of rotten bluestone (basalt) at a depth of 25 feet, and sank a shaft in it to 85 feet, where slate was struck dipping north 7 in 4 horizontal. The shaft was continued to 100 feet, where the basalt was cut at 9 feet north of the shaft, and the drive was continued to the other edge 40 feet distant. This wall was found to be vertical. Still under the impression that the basalt was filling an alluvial gutter, the party sank a blind shaft 80 feet deep in the north drive at 7 feet from the northern edge of the basalt, before the heavy water compelled them to cease operations. The material from the blind shaft was described as having "the appearance of rotten bluestone (basalt), but there is a good deal of sandstone; slate quartz and pipeclay intermixed with it."[1] Although, almost at the start, the theory that it was a chasm in the bedrock filled with basalt was held, further sinking would have been carried out by the company, who supported the view that it was a surface layer by stating that basalt was found at 80 feet in a shaft situated 500 feet south-east from its own shaft. This shaft, however, was on the same dyke.

In the Grey Horse company's No. 3 shaft, at Little Bendigo, an east and west dyke was met with. It is also exposed in a quarry on a reef eastwards from the shaft. Samples vary from the normal basic type in being highly micaceous; the rock is probably more closely allied to the lamphophyre group than to the basalt. At the surface, this dyke decomposes to a tenacious mottled clay.

Murray mentions a basalt dyke in the workings of the Sovereign mine, but no extension of this in an easterly direction can be seen in the New Normanby or North Normanby mines.

## MINERALS.

Most of the following minerals were noticed during the progress of the survey; the remainder have been recorded in other reports on Ballarat.

Albite, ankerite, apatite, aragonite, arsenolite, arsenopyrite, augite, calcite, chalcopyrite, chlorite and chloritoid, copiapite, dolomite, epsomite, felspars, galena, gold, graphite, halloysite, hyalite, iron pyrites, kaolin, labradorite, limonite, löllingite, marcasite, melanterite, mica, molybdenite, olivine, orpiment, pholerite, pyrrhotite, quartz, realgar, rutile, siderite, steatite, sphalerite, stibnite, tetrahedrite, travertine.

### Albite.

Soda felspars as a group play a conspicuous part in the ore-bodies in the Ballarat West mines; albite is common, more usually in the spurs than in the laminated lode-tracks. It is usually dull white with striated crystal faces, and is often associated with kaolin in the one specimen. Graphic intergrowths with quartz are common. Occasionally veins of pure albite are found in the sandstones in which also quartz spurs occur. Massive samples, up to 3 in. across, are found in the Sebastopol Plateau No. 1 mine in the spur workings at the 378-ft. level; in the lode above the 800-ft. level; and in the west cross-cut at 880 feet from the shaft, 900-ft. level; and also in the South Star mine at the 1,100-ft. level. Albite was noticed in the Star of the East mine at the 1,300-ft. level, and in the adjoining Band and Loch shaft at a similar depth; large masses mixed with the reef-formation occurred below the laminated portion of the Guiding Star lode.

A sample from the cross-cut east from the rise above No. 3 level, Sebastopol Plateau No. 1 mine, was analysed at the Geological Survey Laboratory (No. 497/07).

| | % |
|---|---|
| $SiO_2$ ... ... ... | 65.3 |
| $Al_2O_3$ ... ... ... | 15.5 |
| $Fe_2O_3$, FeO ... ... ... | trace |
| MgO ... ... ... | 1.1 |
| CaO ... ... ... | nil |
| $Na_2O$ ... ... ... | 8.1 |
| $K_2O$ ... ... ... | 1.6 |
| $TiO_2$ ... ... ... | nil |
| Cl ... ... ... | nil |
| $SO_3$ ... ... ... | nil |
| Undetermined ... ... | 8.4 |
| | 100.0 |

In the Ballarat East mines, albite is a common constituent of the reefs. Lidgey[1] notes that albite is "associated with the belt of country containing the Sulieman lode, and occurs commonly in the beds much further east than the lode." In the Victoria United, the Britannia United, the Last Chance and the Llanberris mines, albite occurs in abundance in the Pug lode. In the First Chance, it is associated with quartz and dolomite in the anticlinal spurry formations at the 700-ft. level. In the New Normanby and the North Woah Hawp mines, between the Indicator and the western workings, and in the Woah Hawp Canton, albite was noticed in quartz veins in the Indicator belt. In the Ballarat East mines, more commonly on the Indicator workings, the albite frequently assumes a greenish tinge when freshly broken underground, but rapidly fades when exposed to surface conditions. Examinations made in the Laboratory (No. 176, 1911) indicates that the green colouring matter appears to be chloritic and due to ferrous silicate.

### Ankerite.

Ankerite is frequently associated with dolomite in the shallow workings of the Ballarat East mines, though, on the western lines, the dolomite is almost free from admixture with carbonate of

[1] Dicker's *Mining Record*, vol. III., p. 279.

[1] Special Report on the Ballarat East Goldfield.

iron. In the New Normanby mine, at the 1,200-ft. level, crystalline layers of mixed carbonates, including ankerite, form on the surfaces of numerous cavities in the east and west basic dyke. The crystals are usually iridescent.

APATITE.

Under the microscope, apatite is conspicuous as a constituent of the dolerite ("top rock") of the Sebastopol Plateau. Analyses of samples of the dust from the rock-breaker at the municipal quarry, Alfredton, were made at the Ballarat School of Mines, and gave 0.53% of phosphoric acid.

ARAGONITE.

Aragonite in stout prisms, commonly branching, is found in a basic dyke associated with calcite, dolomite, and ankerite at the New Normanby mine, Ballarat East. Aragonite also occurs as crystals and incrustations in the basalt at Sebastopol, for example at the Central Plateau mine and the quarries on the west side of the Yarrowee Creek. It is frequently noticed in the dolerite at the corporation quarry, Alfredton.

ARSENOLITE.

White crystals of arsenolite are associated with decomposing arsenopyrite at the 600-ft. level of the New Kohinoor mine. This level was closed for a number of years, and when it was re-opened the minerals arsenolite, realgar, and orpiment were found on the floor of the drive and on the timber.

ARSENOPYRITE.

Arsenopyrite, both crystalline and massive, is met with throughout the whole of the field, but it is most common below water-level. The two varieties occur in the 1,400-ft. and 2,080-ft. levels, No. 9 shaft, Band and Albion mine. As a lode constituent arsenopyrite is commoner in non-laminated than in laminated quartz. At Ballarat East it is frequently confined to certain slates and sandstones, and a belt of slates about 150 feet west of the "Indicator" is characterized by large crystals throughout the whole of the mines on this line. In quartz spurs cutting the slates west of the "Indicator," lumps up to 10 lbs. in weight are common. Massive arsenopyrite free from quartz and iron pyrites is frequently auriferous. In the 600-ft. level of the Kohinoor mine beyond the laminated portion of the Consols lode on the anticline, massive arsenical pyrites occurred; the assay value of one mass weighing 5 cwt. was gold 0 oz. 7 dwt. 20 gr., silver, 0 oz. 1 dwt. 7 gr. per ton, and concentrates 65 per cent.

In the sandstones perfect crystals (orthorhombic brachydomes) are common, more especially in the vicinity of the North Woah Hawp mine.

In the workings east off an intermediate drive above the 600-ft. level in the Kohinoor mine, single crytals up to ½-in. across were noticed. Twin crystals are common in the Ballarat East mines. Above water-level the arsenopyrite is frequently decomposed, but casts of the crystals remain.

Samples from the deeper levels of the Band and Loch mine indicate that löllingite is present.

AUGITE.

Small crystals of augite, associated with loose felspar crystals, occur in cavities in the dolerite which forms the "top rock" of Ballarat West. The crystals are black or greenish-black, and range up to ⅛-in. in length.

CALCITE.

Calcite occurs crystalline in veins, lamellar in places, associated with the slates and sandstones of most of the mines, and often merges into dolomite by imperceptible stages. It is associated with a basic dyke in the New Normanby mine, where it infills vughs together with ankerite. Pure calcite forms veins up to 1-in. thick in the basic dyke in the Victoria United mine. In the South Star mine veins of pure calcite occur in sandstone, and associated with the crystalline calcite are patches of soft chalky material ("rock milk"); in some places granular calcite lines crevices in the sandstones. Thin films of crystalline calcite on joints give a splendent effect underground, but readily become dull on exposure.

CHALCOPYRITE.

Copper pyrites is most frequently found in the more highly mineralised portions of the lodes and is usually present in small quantity. It has been noticed in the Victoria United, Last Chance and North Normanby mines and on the mullock heap of the Dalzell Buchanan mine. It is also found massive in the synclinal reef south of the cross-cut at the 378-ft. level, Sebastopol Plateau No. 1 mine, where masses up to ¼ lb. in weight were obtainable. It occurs as grains in the granitic dyke at the 1,100-ft. level, Star of the East mine, and at the 1,250-ft. level, Northern Star mine.

CHLORITE AND CHLORITOID.

Minerals of this group occur as a common constituent of the slates and quartz lodes in the field. In the mines of Ballarat East, veins of chloritic mineral up to ½-in. wide are common. Quartz veins, usually "verticals," commonly contain a large proportion of this mineral. Chlorite is regarded by Professor Gregory as an essential of the "Indicator." It also occurs massive in adjacent slates and quartz veins. The presence of chlorite ("Irish" or "poverty") is not considered a favorable indication of gold by the miners. It is distributed throughout the whole of the Ballarat East mines.

At Ballarat West chlorite is common in certain belts. At the Sebastopol Plateau No. 1 mine it is found as loose crystalline masses in green quartz. An analysis was made at the Geological Survey Laboratory of a sample which consisted of almost pure chlorite merging into green quartz. The green mineral was isolated and examined with the following result (No. 519/07):—

| | % |
|---|---|
| $SiO_2$ ... ... ... | 21.71 |
| $Al_2O_3$ ... ... ... | 39.61 |
| $Fe_2O_3$ ... ... ... | 0.08 |
| $FeO$ ... ... ... | 24.17 |
| $MgO$ ... ... ... | 4.02 |
| $CaO$ ... ... ... | nil |
| $H_2O-$ ... ... ... | 0.15 |
| $H_2O+$ ... ... ... | 10.73 |
| $P_2O_5$ ... ... ... | nil |
| $Cr_2O_3$ ... ... ... | nil |
| $SO_3$ ... ... ... | nil |
| | 100.47 |

Colour, dark green. H = 3. Sp. gr. = 3. Streak, greenish white. Lustre, pearly. Massive foliated with fine grained structure.

Chlorite is seldom noticed in the laminated lodes, but is usual in the spurs. It occurs in a large quartz formation at the 2,080-ft. level, Band and Loch mine. In quartz verticals in the Ballarat City and the Ballarat prospecting mines, it is associated with non-auriferous quartz. Veins of dolomite and of chlorite are of various relative ages, in some sections chlorite intersecting dolomite and in others *vice versâ*, but in no instance are the chloritic minerals found intergrown with dolomite. Some black slates in the Band and Loch

mine regarded by Professor Gregory as chloritic, were examined in the laboratory (samples 599 and 600, 1907) and it was found that the chloritic looking portion contained under 1 per cent. of ferrous iron and consisted of magnesium silicate; the specimens contained 2.37 per cent. and 3.92 per cent. of carbon respectively, so that instead of chloritic slate, the name graphitic slate would be more appropriate.

### COPIAPITE.

This sulphur-yellow earthy product is formed from decomposing pyrites in the moist atmosphere of drives at shallow levels and forms incrustations which become powdery and break up after the rocks become dry. It is abundant in the Last Chance (800-ft. level), the Llanberris, the Woah Hawp No. 1, and the Woah Hawp Central mines.

### DOLOMITE.

Dolomite is a common constituent of the lodes of Ballarat West, and it also occurs as veins in the slates and sandstones. Some light-colored slates associated with the black slate zone are highly dolomitic. Dolomite is usually tinged faint blue, in contrast to the dead-white quartz or albite. Perfect crystals are rare, but the mineral is always crystalline. In the Ballarat East mines dolomite is frequently crystalline and is white, at times tinged with blue, yellow, or red. In some places small veins consist of equal proportions of dolomite and quartz. It is sometimes massive and is then usually ferruginous and reddish in colour, lumps weighing several pounds and apparently devoid of crystalline structure being frequently met with. By some of the miners it is regarded as a favorable indication of gold, by others of no significance. On the mullock heaps, as well as in exposed places underground, it often acquires a reddish tinge owing to the oxidation of the iron which it contains, the calcite and less ferruginous dolomite remaining white. Dolomite is common in all the mines of Ballarat East, but it appears to be confined to the mineralised portion of the field. Specimens from vughs in the quartz lodes commonly show the following order in crystallization:—(1) Quartz crystals, (2) dolomite crystals, (3) pyrites crystals (pyritohedra).

Along the cleavage planes, especially above water-level, thin films of dolomite occur and produce striking effects in weathered samples. By some of the miners the massive dolomite is confused with the felsite dykes ("pug" and "sediment").

### EPSOMITE.

Fibrous crystals of epsomite occur in the old levels of many of the mines and are very plentiful in the vicinity of the "pug" and "sediment" dykes, especially in the Last Chance and the Llanberris mines. At the 200-ft. level of the Woah Hawp Central mine they are associated with sulphate of iron (melanterite) in decomposing pyritic material.

### FELSPARS.

Felspars occur in the quartz reefs and veins (*see* albite), as porphyritic crystals in the granitic dyke (*see* p. 55) and as minute crystals in the ground-mass of the felsite dykes of Ballarat East and in the basalts and dolerite.

### GALENA.

Galena is sparsely scattered throughout the whole of the quartz reefs in this district as small widely scattered crystals. It is commonly more abundant in the auriferous portions of the reefs than elsewhere, but is not an infallible guide to gold, as specimens frequently occur in barren veins. Crystals with faces up to 1 in. across were found in spurs above the 378-ft. level of the Sebastopol Plateau No. 1 mine and in the synclinal formation at the same depth. At the Woah Hawp No. 2 mine above the 400-ft. west cross-cut large crystals were associated with sphalerite. In the laminated lodes of Ballarat West very small crystals, which gave a bluish colour to the quartz in which they were embedded, were frequently noticed.

### GOLD.

Gold occurs most commonly in the alluvial deposits (where it has been derived from the quartz reefs), and embedded in quartz or pyrites, but occasionally it is found in slate, in dolomite, and in sandstone. The gold found in the alluvial ranged from minute particles to large nuggets. In the quartz it ranges from minute colours to masses weighing 450 oz. on the "Indicator" (Woah Hawp Canton mine). Crystals are usually found in quartz spurs intersecting sandstone. Occasional fine crystals occur in the Ballarat East mines (from the Victoria United to the Woah Hawp Canton), and in the First Chance and the North First Chance mines west of the Sulieman lode. In the Central Plateau and Sebastopol Plateau No. 1 mines cubes, octahedra, dodecahedra, &c., occur, but they are usually under $\frac{1}{8}$ inch across. In the "Indicator" veins the gold generally occurs as shotty grains without crystal faces. It is sometimes enclosed in pyrites, and is occasionally found with filaments entering crevices in the crushed quartz, which is common in these veins (for examples, see the Woah Hawp Canton mine, p. 245) In magnesian slates it frequently occurs as films on cleavage or other surfaces, and is occasionally noticed on slickensided faces as "paint gold." In cavities where pyrites, &c., has decomposed in surface stone, irregular, loose particles of gold are sometimes found with casts of pyrite crystals indented on their surfaces. At the Last Chance and First Chance mines gold is occasionally found in dolomite which accompanies quartz spurs, and at the New Normanby mine specimens were noticed in sphalerite.

### GRAPHITE.

Graphite and carbonaceous material form a conspicuous part of the lode-matter at Ballarat West. A lustrous black graphitic slate, with a little pyrites, from the Band and Loch mine, was examined at the Geological Survey Laboratory, and was found to contain 3.92 per cent. of carbon (No. 600/07). Where movement has taken place along the black slates, highly polished graphitic material up to 12 in. in width occurs. At the South Star mine such material is found to a depth of 3,100 feet below the surface, at the Star of the East mine to 2,200 feet, and at the Band and Loch mine to 1,900 feet.

### HALLOYSITE.

A secondary silicate referable to halloysite is found in the amygdaloidal cavities at the base of the "top rock" on the Sebastopol plateau. It forms irregular nodules of various shapes and sizes in the cuttings near the Band and Albion battery, and in Barkly-street, Mount Pleasant, and in the Central Plateau No. 2 shaft. When freshly dug out it is usually greenish and very soft. It bleaches white in drying, and acquires a hard external surface under natural conditions, but under artificial conditions it usually crumbles to a white clay-like mass which absorbs water, but does not become plastic.

### HYALITE.

Hyalite forms incrustations in cavities in the dolerite of the Sebastopol plateau. It is whitish when dried, but is usually bluish-green in freshly broken basalt. Cavities coated with hyalite in samples from the Central Plateau No. 2 shaft were found to contain liquid after months of exposure to atmospheric conditions, the siliceous coating making the cavities air tight.

### IRON PYRITES.

Iron pyrites ("mundic") occurs as cubes ranging from microscopic size to ¾ inches across. The faces are sometimes curved, and are frequently striated. Crystals with octahedral faces were observed in a dolomite vein in the Victoria United mine at the 1,400-ft. level. Elongated crystals, forming prisms three times as long as they are broad, were met with in the Ballarat Prospecting mine, and in the City mine. Pentagonal dodecahedra occur in vughs in the quartz reefs, usually on the face of quartz or dolomite crystals; such crystals are common in the debris from the Turntide mine (south of the present survey), and were noticed in a breccia at the Sebastopol Plateau No. 1 mine. Concretionary pyrites forms the cementing material in brecciated portions of some of the lodes, and also in many of the cross-courses. Films of secondary pyrites occur in the cracks and crevices of the quartz reefs, and usually display a bright play of iridescent colours. Secondary pyrites is also noticeable in old mine timber, especially that from the old alluvial workings.

Cubical pyrites appears more abundantly in certain belts of slate and sandstone than in others. This is most noticeable in the Ballarat West mines, where the pyrites is commonly found in the vicinity of the black slates, the adjacent beds being almost barren. Iron pyrites is a characteristic constituent of the lodes of Ballarat West, occurring in the laminated quartz to the almost entire exclusion of other varieties of pyrites. The carbonaceous slates appear to have had a pronounced effect on the deposition of the iron sulphide (see also arsenopyrite, p. 57). This is significant, as the proportion of iron pyrites is usually small in spurry formations. Iron pyrites is found as isolated crystals or as veins along bedding or cleavage planes. This is a characteristic feature of the main "Indicator," the pyrites of the parallel lines being commonly arsenopyrite.

While pyrites is frequently regarded as auriferous, experience at Ballarat has shown that only when the reefs contain visible gold are the concentrates worth saving, and it is generally conceded that the cause of the apparent richness of the pyrites is largely a matter of mechanical inefficiency in separating the fine free gold from the pyrites. Though this may often be the case, examples of intergrowth of pyrites crystals and gold are met with.

### KAOLIN.

While masses of kaolin occur in the quartz reefs throughout the field, the origin of the kaolin cannot be altogether ascribed to decomposition of the felspars, as undecomposed felspar and kaolin are frequently associated. Felspar in quartz is noticeable in the surface workings, though kaolin in quartz is common at the deepest levels, as for example at the 2,080-ft. level in the Band and Loch mine, at the 1,200-ft. level in the Woah Hawp No. 1 mine, and at the 1,500-ft. level in the New Normanby mine. It is usually met with in the larger quartz formations, spurs, &c., at considerable distances from dykes.

The pug and sediment dykes in the surface workings decompose to a kaolin-like clay, slightly iron-stained, but below 500 feet from the surface the dykes are solid. The Yorkshire dyke is decomposed to a very fine-grained clay, which is refactory and suitable for a fire clay.

### LABRADORITE.

A felspar referable to labradorite is the most common constituent of the dolerite of the Sebastopol Plateau. Good crystals of fair dimensions are common in the vesicular portions of the rock, at times lying loose or projecting into the cavities. Occasionally, augite crystals penetrate the felspar crystals.

### LIMONITE.

In the shallow workings of Ballarat East, crusts of limonite and earthy iron ochre occur on the walls and floors of the abandoned levels. Limonite is commonly deposited in the final stage of the draining of the strata. Among the workings on the laminated lodes of Ballarat West, limonite is common in the old drives, and at the deeper levels it is associated with the final stage of the deposition of travertine. It also forms stalactites and stalagmites in layers a foot or more thick. As pisolitic iron ore, limonite forms a thin wide-spread deposit on the surface of the basalt of the Sebastopol Plateau. Pseudomorphs of limonite after pyrite are common in surface exposures at the Black Hill, the White Horse Ranges, and other places.

### LÖLLINGITE.

Löllingite appears to occur in the deeper levels of the Band and Loch mine.

### MARCASITE.

Marcasite or nodular pyrites is common in the alluvial workings and in the shallow levels under them. It readily decomposes when exposed to atmospheric conditions. It usually forms along crevices in the quartz.

### MELANTERITE.

Melanterite crystals are found among decomposing pyrites in the shallow levels at the Woah Hawp Central and the Llanberris mines, Ballarat East, and at the Kohinoor, and the Ballarat Prospecting mines, Ballarat West.

### MICA.

Fine flakes of mica are noticeable in many of the sandstones of Ballarat East. Some of these may be original, but, under the microscope, many appear to be the result of recrystallization of other minerals under dynamic action. The flakes are usually small, and are arranged in crushed lines. In association with the quartz formations of Ballarat East are aggregates of minute scales (probably sericite) forming silky lustrous surfaces commonly on chloritic material in the wall rock. In the granitic dyke in the Star of the East mine mica is plentiful. At the Grey Horse mine, north-east of the present survey, is a mica-trap dyke, which consists almost entirely of mica.

### MOLYBDENITE.

Traces of molybdenite were noticed in the large porphyritic dyke that runs north and south through the field (see p. 55).

### OLIVINE.

Olivine is conspicuously absent in the "top rock," which covers the whole of the Sebastopol Plateau, but is common in the "second rock," which is exposed in the Yarrowee Valley. The crystals are yellowish to green in colour, usually small, but often well shaped. A basalt rock rich in olivine occurs to the north-east of Ballarat, and olivine nodules are common in the scoria cones of Buninyong and Warrenheip. In the basic dykes of the New Normanby and the Victoria United mines olivine is recognisable only in microscopic sections.

### ORPIMENT.

Orpiment is common in the abandoned workings at the 600-ft. level of the New Kohinoor mine, where it forms an incrustation on the quartz and timber. The colour is bright yellow and very distinctive. It is associated with realgar and arsenolite resulting from decomposition of arsenopyrite in the lode-channel. It is also met with in old workings at the Reward and Woah Hawp No. 1 mines.

### PHOLERITE.

In parts of the reefs, usually on the footwall, small white plates with pearly lustre are associated with kaolin and sericite, from which their crystal outlines serve to distinguish them. These plates are considered to be pholerite. Pholerite was more noticeable among the Ballarat East mines on the Sulieman Pasha line (*e.g.*, in the First Chance and the North First Chance mines) than on the more easterly belt.

### PYRRHOTITE.

Small quantities of massive pyrrhotite are found in the Victoria United, the Last Chance, and the Normanby mines, on the pug or leather jacket formation. It also occurs in the Band and Albion No. 9 shaft with arsenical pyrites at the 1,300-ft. level on the Guiding Star lode. It is commonly associated with the more highly mineralized portions of the reef.

### REALGAR.

Realgar occurs in crevices in the quartz at the 600-ft. level, New Kohinoor mine, as the result of decomposition of arsenical pyrites. It is associated with orpiment and arsenolite. It may be commoner than would appear, and be masked by iron oxides.

### RUTILE.

Rutile is considered by Professor Gregory to be an abundant constituent of some of the indicators.

### SIDERITE.

Pure siderite was not noticed during the survey, but ferruginous dolomites are common. Siderite may be present with calcite, dolomite, and ankerite as veins in the strata and reefs, but so intimately associated with them as to escape detection. On weathering the dolomites have commonly a ferruginous discoloration.

### STEATITE.

A magnesian silicate, resembling impure steatite occurs in the cross-course on the boundary between the Reward and the New Indicator mines at Ballarat East at a depth of about 600 feet.

### SPHALERITE.

Sparsely scattered crystals of a ferruginous variety of sphalerite (zinc blende or black-jack), dark brown to black in colour, are common in the auriferous portions of many of the quartz lodes in Ballarat East. In rare instances it occurs in such abundance as to form a quarter of the vein material. An example was met with in the New Normanby mine in spurs on the western Indicator country below the 1,200-ft. level, where the sphalerite mixture contained several ounces of gold to the pound of ore. In the Woah Hawp No. 2 mine, sphalerite occurs in masses several inches across in unpayable quartz. It is also associated with chalcopyrite and galena in the synclinal reef at the 378-ft. level, Sebastopol Plateau No. 1 mine. This formation is not payably auriferous. Sphalerite is common in the auriferous portions of the laminated lodes of Ballarat West, but occurs only as fine grains or flakes.

### STIBNITE.

Stibnite is reputed to occur in the Bonshaw mine. In 1869, a sample from a reef at the Band and Albion Consols Company's alluvial workings yielded nearly 73 per cent. antimony. In the east cross-cut at the 600-ft. level of the Central Plateau Extended mine several pounds of an antimonial mineral was taken from a pocket on a fault 12 feet east of the shaft.

### TETRAHEDRITE.

Tetrahedrite associated with pyrites, chalcopyrite, sphalerite, calcite, brown spar, and siderite in quartz is reported by Krause[1] in the 1,200-ft. level of the Band and Albion mine, but he does not record at what shaft. This mineral was not noticed during the survey.

### TRAVERTINE.

Incrustations of travertine form on the walls and floors of the drives, especially in the deeper levels. They consist chiefly of carbonates of lime and magnesia, with iron. In the Ballarat West mines travertine was first observed at a depth of about 1,000 feet, the water from the lodes at that depth forming incrustations on timber or in pipes, which were sometimes completely blocked. In the Star of the East mine the travertine accumulated to a thickness of several inches on the timbers of the shaft. Thin partings of iron pyrites separated the mass into thin layers. Radial structure is common both in the deposit in the shafts and in the drives. As a rule, the travertine first deposited in the drives is snow-white, but subsequent layers appear to contain more iron, and the travertine becomes much stained, and eventually turns red and black before deposition ceases. Stalactites often unite with the stalagmites on the floor of the levels. For example, in the Band and Albion No. 9 shaft, 1,800-ft. and 1,900-ft. levels, and in the Star of the East, 1,500-ft. to

[1] F. Krause, Introduction to Mineralogy.

2,200ft. levels. When the mine water was utilized for condensation purposes at the mines, the deposit of carbonates caused much trouble owing to the blocking of the waterways. A sample of this deposit on analysis gave:—

| | % |
|---|---|
| $CaCo_3$ ... ... ... | 89.83 |
| $MgCO_3$ ... ... ... | 5.53 |
| $FeCO_3$ ... ... ... | 0.59 |
| Insoluble ... ... ... | 0.43 |
| Total ... ... ... | 96.38 |

The amount of water was not determined.

In the watercourse leading from the South Star mine, where the mine water was allowed to run, a cemented mixture of sand and grass firmly consolidated by travertine was noticed at a distance of ¼ of a mile from the shaft. In the Ballarat East mines, only small quantities of travertine have formed on the walls of the drives, but in the North Woah Hawp mine such coatings are met with at a depth of 800 feet.

## ALLUVIAL MINING.

It was evident that the shallow auriferous ground would soon be exhausted and that the cost of mining deeper alluvial would increase, and a lengthy period of dead work must elapse before gold could be reached.

Trouble with heavy ground, especially when water-bearing, led to more systematic shaft-sinking. Horses and then machinery became necessary for haulage and pumping. It is to the credit of the earliest miners that they faced and overcome all difficulties, practical, theoretical, and financial, though they had no precedents to guide them.

### LICENSES AND MINER'S RIGHTS.

In 1851, the right to mine was secured to the digger by licenses costing £3 per month, but by the end of 1853 the price was reduced to £1 for one month, £2 for three months, £4 for six months, and £8 for twelve months. These charges were unfavorably received by the majority of the miners, and their discontent culminated in the Eureka riots of December, 1854. In 1855 an Act of Parliament provided for the issue of "miner's rights"[1] at £1 per annum, which entitled the holder to mine for gold and to occupy for residence a definite area of Crown lands, at first 11 feet by 33 feet for residence and 12 feet by 12 feet for mining. The Act constituted local Courts of Mines, under the presidency of a warden selected by the Government, to decide on regulations suited to local conditions, such as the extent of ground to be allowed to the miner according to depth of sinking, nature and position of the ground, and the difficulties encountered, the manner of occupation, marking, registration, &c., of claims, the fulfilment of working conditions; the prevention of "jumping" and "shepherding"; and the determination of forfeiture of ground.

[1] Miners' rights were issued from June, 1855, at £1 per annum, and from January, 1866, at 5s. per annum.

In 1858 the mining laws were revised and increased privileges were granted to the holders of miner's rights, allowing for the cutting of timber on their claims, the making of dams, water races, &c., more lengthy tenure under lease, and the provision for the Courts of Mines to be presided over by a Judge empowered to adjudicate in matters appertaining to disputes. As mining developed, certain weaknesses in the system became evident, and in 1865 further legislation lengthened the period for which an area could be secured by a consolidated miner's right. At the same time the price of miner's rights was reduced to 5s. per annum and a larger area was allowed for residence. The yearly rent payable for leases was reduced from £2 10s. to £1 per acre and the limit of tenure was raised to fifteen years.

The Mines Act of 1890 and subsequent Acts dealt with tenure and the areas to be held under miner's rights, but as shallow alluvial mining had by then been discontinued at Ballarat, no further reference need be made to such alterations.

No special account will be given of the early digging operations where shallow sinking either by shaft or open cut usually sufficed; the workings on the deep leads will alone be reviewed.

### MINING ON PRIVATE PROPERTY.

Although a large part of the Sebastopol plateau belonged to the Crown and miners could locate their claims there without restriction, the confines of the area were held under the Private Property Act. Before mining could be undertaken on private property an arrangement had to be made with the owner. In some cases such arrangements were made easy by the land-owner becoming an active shareholder; in others large sums were paid for the right to mine. The Bonshaw Company in 1857 leased 180 acres of Winter's pre-emptive right for £1,000 cash down and £100 rent for a term of five years, but later on they bought the freehold of 580 acres for £20,000. In 1868 the Winter's Freehold Company purchased Mr. John Winter's property, west of Sebastopol, for £50,000 before they began shaft sinking.

The Royal Saxon Company paid 3/40ths of the gross yield of gold, free of all expenses, as royalty to the land-owner of portion of the claim, while a rent of £2 per week for a period of some years was paid for an adjacent property.

### CO-OPERATION.

Co-operation of shareholders in the working of alluvial claims was a striking feature in early Ballarat. Every shareholder took part in working the mine, usually under the leadership of the most experienced man of the party as "captain" and a secretary who carried out the clerical duties. As the claim-holders found the need for more men to overcome the difficulties that arose, the party was increased either by amalgamating with an adjoining party or by splitting up the shares. It was thus a common thing to find as shareholders working at the larger mines, carters, wood-cutters, carpenters, masons, and engine-drivers, as well as miners, and thus every portion

of the work was carried out by the owners of the claim. The timber for the shafts and for fuel was cut in the forests near Mt. Warrenheip and squared or sawn and carted to the mine. The rock from the shafts was dressed and used for building-in the machinery. And thus, so far as labour was concerned, especially in the earlier stages, no trouble arose. When it became necessary to provide machinery calls were made (unless the party had been successful in shallow ground) and sometimes sleeping partners were taken in.

### FINANCE, FURNISHERS, ETC.

To finance the miners during the long and costly work of shaft-sinking through basalt and drift, sleeping partners or "furnishers" were given shares. The furnisher was commonly a capitalist who provided the machinery and at times portion of the funds to pay for extra labour. When gold was struck the expenditure on the part of the furnisher ceased and he shared in the dividends with the working partners, all working expenses being paid out of the gold won.

The method of paying dividends varied. In some instances, as in the Prince of Wales Company, all the gold won was sold and the proceeds were divided among the shareholders, on whom a call was made for working expenses and costs. In others material, &c., was paid for and the balance was divided among the shareholders who, if not working in the mine, were responsible for the payment of the wages due to the miner engaged on their behalf. In most cases, however, the whole complement of shareholders worked in some capacity or other on the mine and shared alike in the distribution of the profits.

This system of co-operation, however, had its limits, and joint stock companies were formed in which the liability of each shareholder was limited. Practically the whole of the alluvial mines in the Ballarat district were worked under the co-operative system and Limited Liability Act.

### RATE OF WAGES.

From the time when the owners themselves were no longer able to carry on their operations and had to employ outside labour, the rates of wages per week were—

| | £ s. d. | | £ s. d. |
|---|---|---|---|
| Miners .. .. .. | 2 2 0 | to | 2 5 0 |
| Engine-drivers .. .. | 2 10 0 | to | 2 15 0 |
| Carpenters .. .. | 3 0 0 | to | 3 10 0 |
| Pitmen .. .. .. | 2 10 0 | to | 3 10 0 |
| Blacksmiths .. .. | 3 10 0 | to | 3 15 0 |
| Truckers .. .. | 1 0 0 | to | 1 10 0 |

### SIZE OF CLAIMS.

It was soon recognised that the areas allotted for shallow alluvial claims were altogether inadequate for deeper claims, where basalt and drift were encountered, and, in 1855 and 1856, the local Court of Mines adopted regulations which increased the size of claims from 12 feet square per man to 34 feet by 34 feet for eight men. The shaft was to be in the centre of the claim, and in all cases the shafts were to be within 40 feet of each other (4th October, 1855). Mining under this regulation was carried on at Frenchman's Lead (March, 1856), Black Lead (April, 1856), and Gravel-pit Lead (June, 1856). When the direction of a lead was unknown, the right to such a limited area offered little inducement to miners to spend weeks or months in shaft sinking; and, in June, 1856, the size of the claims was therefore made dependent upon the depth of sinking and the difficulties to be overcome. Block claims for eight men were fixed at—A, 34 x 34 feet; B, 41 x 41 feet; C, 48 x 48 feet; D, 58 x 58 feet. Smaller claims were not affected. Four classes of frontage claims were provided for—A, 24 x 24 feet; B, 34 x 34 feet; C, 40 x 40 feet; and D, 48 x 48 feet.

The block-claim system had many faults, and led to the shepherding of areas. An unsuccessful endeavour was made to overcome this difficulty. The system of frontage claims was then introduced, giving a definite length of gutter; but this system resulted in some areas being granted which could only be marked off after the course of the gutter had been determined. These regulations were first applied to the claims on the Frenchman's Lead, and they allowed for lengths along the lead ranging from 50 feet for eight men when the sinking was 50 feet up to 225 feet for a similar party when the sinking was 400 feet. Rules and regulations for all possible cases were drawn up. These measures were at first useful, but later they led to much litigation in consequence of overlapping, &c. In September, 1866, frontage claims were replaced by block claims of fixed dimensions, and later by Crown leases, which gave areas large enough to induce miners and capitalists to work the leads, and at the same time safeguarded them from litigation.

That the size of claims under the frontage system was inadequate may be seen from the following table giving particulars of the Frenchman's and White Horse Leads, Sebastopol:—

| Claim No. | Depth Sunk. | Length Driven. | Expenses. | Gross Output. | Profits—Wages per day. |
|---|---|---|---|---|---|
| | Feet | Feet. | £ | £ | £ s. d |
| 1 .. | 240 | 170 | 450 | 4,185 | 1 6 0 |
| 2 and 3 .. | 305 | 120 | 718 | 6,260 | 0 17 6 |
| 4 and 5 .. | 370 | 110 | 650 | 3,700 | 0 8 0 |
| 6 | 335 | 130 | 700 | 4,050 | 1 6 0 |
| 7 to 9 .. | 380 | 270 | 700 | 9 000 | 1 0 6 |
| 10 to 12 | 440 | 90 | 2,000 | 6,500 | 0 10 0 |
| 13 and 14 | 400 | 50 | 710 | 300 | 0 11 0 |
| 15 to 19 | 800 | 110 | 1,000 | 9,100 | 0 9 0 |
| 20 to 22 | 584 | 210 | 900 | 9,000 | 0 15 0 |
| 23 to 27 | 912 | 370 | 3,050 | 15,000 | 0 9 0 |

Claims on the Gravel-pit Lead under the basaltic plateau gave similar results:—

| — | Men. | Period in Months. | Gross Yield. | Expenses. | Wages per Week. | Remarks. |
|---|---|---|---|---|---|---|
| | | | £ | £ | £ s. d. | |
| Union Co. | 48 | 18 | 13,4-0 | 800 | 3 10 0 | Includes expenses |
| North Grenville | 40 | 36 | 28,000 | .. | 4 10 0 | Includes expenses |
| Grand Junction | 40 | 27 | 11,500 | .. | 2 10 0 | |

The areas held under the block system were at times excessive, and this was contributed to by multiple registrations by the same shareholders for claims on the various leads. A striking case of the amount of ground held, and the area over which this amount could be varied, was furnished by the claim of the Band of Hope Company (*see* Fig. 19, United Extended Band of Hope).

### SELECTION OF SHAFT SITES.

The selection of shaft sites on the shallower leads was never difficult, for the trend of the leads within reasonable limits was assured; but, when leads were worked under the basalt plateau, where the bottoming of the shafts was a matter of many months, more care in selection of sites was necessary; and, at an early date (1857), recourse was had to boring. This work was carried out by hand labour throughout the whole period of alluvial mining at Sebastopol and Ballarat West. Holes ranging in depth from 100 feet to 300 feet were drilled; in the case of the deeper holes progress was slow, but when several parties were at work on a series of holes the results were satisfactory. The Albion Company, at Sebastopol, in 1857 and 1858, was the first co-operative party to bore, and in twenty months they sank 23 bores, aggregating 5,000 feet, proving the claim for a length of 1½ miles. In 1857, the Band of Hope Company bored in the vicinity of the park but failed to bottom. Another company, the Perseverance, reached a depth of 296 feet, when further boring was blocked. The Great North-West Company, in the late fifties, sank a bore to 309 feet. At Winter's Freehold Mine, in the sixties, boring for the lead was carried out after the shaft site had been selected. In the selection of the shaft sites two divergent views were held. Some of the miners selected the point over the deepest ground, but others favoured the shallowest ground, and sank in the bedrock and drove for the deep ground.

Many shafts were sunk haphazard; this indiscriminate sinking was fostered by the frontage system. The Cosmopolitan shaft was 1,300 feet from the gutter, and the Kohinoor Company's No. 1 shaft was a similar distance away. The Band of Hope Company's No. 3 shaft, the Kohinoor Company's No. 2 shaft, and the Defiance Company's shaft were sunk directly into the gutter, which had, however, been located prior to boring.

An example of the cost of boring, together with the strata passed through, was furnished by the manager of the Great North-West Company in 1863.

First Bore.—Begun, 9th September, 1862; finished, 13th April, 1863. One smith at 60s., working superintendent at 65s., miners at 50s.; total cost, £404 15s. 1d. Depth, 309 ft. 9 in.:—

| Strata. | Thickness ft. in. | Depth. ft. in. |
|---|---|---|
| Surface clay .. .. | 6 0 | 6 0 |
| 1st basalt .. .. .. | 17 0 | 23 0 |
| Red clay .. .. .. | 11 0 | 34 0 |
| 2nd basalt .. .. .. | 150 8 | 184 8 |
| Clay .. .. .. | 28 5 | 213 1 |
| 3rd basalt .. .. | 52 10 | 265 11 |
| Clay .. .. .. | 9 8 | 275 7 |
| 4th basalt (not through) .. | 34 2 | 309 9 |
| Total .. .. | 309 9 | |

Second Bore.—Begun, 1st April, 1863; finished, 11th June, 1863. Depth, 210 ft. 11 in. Cost, £172 8s. 9d.:—

| Strata. | Thickness. ft. in. | Depth. ft. in. |
|---|---|---|
| Surface clay .. .. | 5 0 | 5 0 |
| Basalt .. .. .. | 173 7 | 178 7 |
| Dark clay .. .. .. | 2 0 | 180 7 |
| Black clay .. . .. | 1 0 | 181 7 |
| Grey clay .. .. .. | 2 0 | 183 7 |
| Fine white drift .. .. | 3 0 | 186 7 |
| Quartz and clay .. .. | 3 0 | 189 7 |
| Cement and quartz .. .. | 2 0 | 191 7 |
| Red and blue clay .. .. | 1 0 | 192 7 |
| Red clay and quartz .. | 2 0 | 194 7 |
| Blue and red clay and quartz | 5 0 | 199 7 |
| Quartz .. .. .. | 1 0 | 200 7 |
| White and yellow pipeclay .. | 5 0 | 205 7 |
| Sandstone (reef) .. .. | 5 4 | 210 11 |
| Total .. .. | 210 11 | |

Third Bore.—Begun, 1st June, 1863; completed, 25th August, 1863. Depth, 190 ft. 1 in. Cost, £231 3s.:—

| Strata. | Thickness. ft. in. | Depth. ft. in. |
|---|---|---|
| Surface clay .. .. | 15 0 | 15 0 |
| 1st basalt (soft) .. .. | 10 0 | 25 0 |
| Red clay .. .. .. | 9 0 | 34 0 |
| 2nd basalt (very hard) .. | 141 10 | 175 10 |
| Soft basalt .. .. .. | 4 7 | 180 5 |
| Clay .. .. .. | 4 8 | 185 1 |
| Reef (bedrock) .. .. | 5 0 | 190 1 |
| Total .. .. | 190 1 | |

Diameter of bore in No. 1—3 inches at the beginning, and two lining tubes reduced the size to 1⅞ inch before completion.

The record of strata passed through in the alluvial shafts to the east of the Yarrowee Creek was rarely kept. The material, which consisted of alternating layers of gravel, sand, and clay, varied very little; shaft sinking was cheap, and only small shafts were required.

West of the Yarrowee Creek, where layers of basalt cover the auriferous wash, sinking was slower and more costly; but, on the east, the sinking through layers of drift was shallower. Records of the strata passed through in the great majority of the western shafts were preserved, and are given under the descriptions of the various mines. The strata consist of one to four basalt lava flows, with intervening layers of clay and sand or gravel (drift). The basalt was, in part, vesicular, fractured and waterlogged, and this made sinking difficult; but, with ingenuity and perseverance, the troubles were overcome, though there was little precedent, except that acquired on the field, to guide the miners. A great fault in the earlier shafts was their small size; for example, the Golden Gate shaft was 5 feet by 3 feet, sunk to a depth of 302 feet. Many of the shafts were more or less out of plumb owing to the swelling of the clays and drifts passed through. The earlier shafts were divided into two compartments, one used for hauling, and at times for baling, the other for pumping or for ventilation. Later, a third compartment was provided, and this, together with larger shafts and double-decked cages, made the conditions generally much better.

### SIZE OF SHAFTS.

The small shafts that sufficed for small claims in shallow ground were severely taxed when used in the deep mines, where machinery was essential; but for a long time they were not enlarged, and it now appears almost marvellous that the amount of material won could be hauled with the appliances in use from such small shafts. The shaft of the Defiance Company, formerly the Cumberland Durham and Cornish Company, was 5 feet by 3 feet, divided into two compartments, and was 370 feet. The Golden Gate shaft, on the Redan Lead, commenced in September, 1856, was also 5 feet by 3 feet, and was 302 feet. It was soon found that larger shafts were necessary, but even these were still too small. Of these, the Great Extended Redan Company's shaft (1857) was 8 ft. 6 in. by 3 ft. 3 in. in three compartments, one for pumping and two for winding; the Albion shaft (1858) was 9 feet by 4 feet in three compartments; the Cosmopolitan shaft (1857), 7 ft. 6 in. by 3 ft. 6 in., was sunk to 365 feet, and had three compartments, one for hauling, one for water, and one for upcast of ventilating furnace; the Durham (1862) was 8 ft. 4 in. by 3 ft. 6 in.; the Band of Hope Company (1863) cut down the Golden Gate shaft to 8 feet by 3 feet, and sunk to a depth of 420 feet; the Royal Saxon Company (1858) had a shaft 6 ft. 2 in. by 3 feet 1 inch, divided into two compartments, one for pumping and one for winding; the United Working Miners shaft (1858) was 8 feet by 4 feet, having three compartments, to a depth of 418 feet; the Prince of Wales shaft (1858) was 7 feet by 4 feet in the clear, and had three compartments. Later shafts were the Great Gulf, 9 feet by 4 feet, in three compartments (1862); the St. George shaft, 9 feet by 3 ft. 6 in. (1864); the Spes Bona shaft, 6 ft. 8 in. by 3 ft. 8 in., in two compartments (1865); the United Hand-in-hand and Band of Hope No. 4 shaft, 11 feet by 6 feet (1867); the Great North-West shaft, 9 feet by 5 ft. 6 in., one compartment (5 ft. 6 in. by 4 feet) for pumping and ladderway (1865); Sir William Don United shaft, 7 feet by 3 feet; Scottish and Cornish shaft, 12 feet by 4 feet, in three compartments (1866); the Winter's Freehold shaft, 14 ft. 6 in. by 4 ft. 6 in. in the clear, the largest in the colony (1868); the City of Ballarat shaft, 10 ft. 6 in. by 6 ft. 3 in. (1871); the No. 3 Band and Albion shaft, 6 ft. 6 in. by 10 ft. 6 in. (1865); the No. 4 Band and Albion shaft, 10 ft. 6 in. by 6 ft. 6 in. (1867).

### RATE OF SINKING.

With small shafts, hard basalt, or waterlogged drift and clays, shaft sinking was a long, slow, and costly undertaking in the early days of deep alluvial mining. In 1856-8 it took 28 months to sink the Golden Gate Company's shaft 302 feet on the Redan Lead. In 1857 to 1860, the Great Extended Redan Company spent 38 months in sinking 338 feet. Other claims were more fortunate. The Royal Saxon Company (1858) sank their shaft 360 feet in less than twelve months; but in this case the shaft site was on a comparatively dry lead. The Hand-in-hand Company's No. 2 shaft (1865) was sunk 410 feet in eighteen months; but, like many of the later shafts, it was not sunk directly in the deep ground. The Albion Company's shaft, which bottomed at 264 feet, was completed to a depth of 470 feet in less than two years; while the Prince of Wales Company took nearly four years to sink 387 feet. The Kohinoor Company (1857) sank their No. 1 shaft 380 feet, 60 feet of which was in the bedrock, in eighteen months; while their No. 2 shaft was sunk 356 feet in nine months. The Band of Hope Company (1858-1862) spent four years in reaching a depth of 340 feet; much time was subsequently lost through swamping, and the total depth of 400 feet was not attained until after eight years of labour. Of the later shafts, those of the Newington Freehold and the New Ballarat Freehold companies were examples of rapid sinking, for, notwithstanding thick layers of water-bearing drift, a depth of 250 feet was sunk in less than nine months. The Winters Freehold Company's shaft (1868) was sunk 460 feet in twelve months. The Great North-West Company (1863-1867) spent four years in reaching a depth of 307 feet, two years' work only adding a few inches to the depth. The City of Ballarat Company reached a depth of 340 feet in March, 1873, and, by December, 1876, was only 409 feet deep; the total sink of 510 feet took six and a half years to complete. This shaft was sunk later to 561 feet, making, in 1877, the deepest alluvial shaft in the State.

### COST OF SINKING.

As might be imagined from the slow rate of progress, the cost of shaft sinking was great, and of the few figures available the following may be cited. The Albion Company, for shaft sinking and machinery, spent £11,500 exclusive of the labour of 36 men for three years. The Band of Hope Company's No. 1 shaft was 400 feet deep, and cost £29,565. The Great Eastern Company's shaft was 265 feet deep, and, including the purchase of machinery, but exclusive of the labour of 24 men for six months, it cost only £1,752. The Kohinoor Company's No. 2 shaft was 356 feet deep, and the cost for labour was £4,628. The New Ballarat Freehold Company's shaft was sunk on contract to 237 feet, at a cost of £6 9s. per foot for labour only. The Prince of Wales Company's No. 1 shaft cost nearly £60,000. The Royal Saxon Company's shaft cost only £4,775, including all material. The St. George Company's shaft, 378 feet deep, together with plant, cost £16,402; this shaft was sunk under contract, the price for the first 60 feet being £8 per foot, and increasing at the rate of £2 per foot every 60 feet to a depth of 300 feet; the average price was £12 per foot, the company providing power, drivers, bracemen, timber, firewood, air pipes, &c., and the contractors found powder, fuses, tools, and had to fix the pumps.

### DIFFICULTIES IN SINKING.

Shaft sinking through layers of basalt with intervening beds of water-bearing drift being new to the mining world, and being undertaken by miners of pluck and resource rather than technical ability, the difficulties encountered and methods of overcoming them were rarely recorded. The chief difficulty lay in sinking through the water-bearing sands or drifts, and to do this piles were frequently driven ahead of and around the position of the shaft. A drift box of sheet iron, stoutly made, was at times used, being forced into the drift by the aid of powerful screwjacks (*see* Fig 16). At the Ballarat Freehold shaft a cast-iron lining built in segments was forced through

the drift. A drift box is usually made of boiler-plate, strengthened at the corners with angle iron. For convenience in lowering down the shaft, the "box" is made in sections, and bolted together at the bottom of the shaft.

After passing through the drift the box is usually left in the shaft, the timbers being built up inside of it. The sand is removed from the inside of the box, and sinking proceeds in the ordinary way.

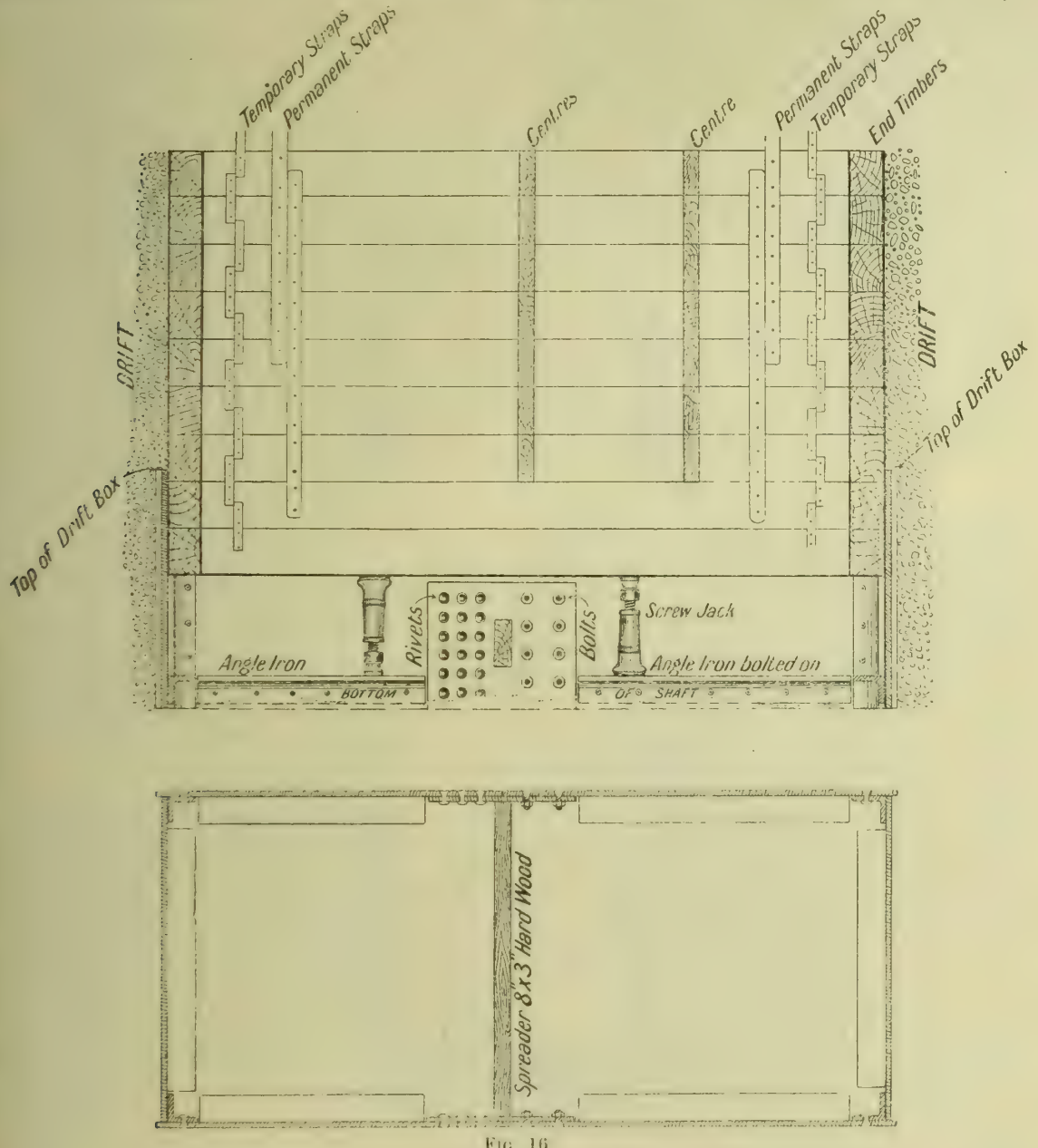



Fig. 16.

The size of the box is regulated by the size of the shaft and the thickness of the timber being used; the box being large enough at its top edges to permit of the shaft timbers being placed within it.

In use, a chamber is excavated at the top of the drift, usually in clay or basaltic rock; the box is here built together and placed in position. Heavy timbers are placed around the shaft to enable screwjacks to be worked against; the box is forced into the drift by means of several screwjacks.

When sufficient depth is reached to allow of a set of timber being placed in position, the jacks on the side or ends are alternately withdrawn and the timbers put in, after which the screwjacks are returned and the adjacent set removed.

The timbers are secured to the frame set by temporary straps until a sufficient number of sets is added, when permanent iron straps are securely nailed on.

In some instances the water in the basalt proved troublesome; this water occurred near the base of the basalt, and when the rock had a vesicular or honeycomb texture, the water frequently retarded sinking. These conditions were found, for instance, in the Durham Company's shaft, on the north side of Lake Wendouree; at a depth of 150 feet the water caused much trouble for a period of two years, until the shaft was lined with timber 6 inches by 6 inches with layers of pine between, and all bolted together, and beyond this a layer of puddled clay. Sand was sometimes used instead of clay.

Although the "puddling back" of the rock-water above the clay had its advantages in expediting shaft sinking, it was ultimately found that, excepting the water in the upper two layers of basalt, it was not a success, for in deep ground bursts of water from the overlying accumulations often proved disastrous both to life and property.

METHOD OF PUDDLING UP A SHAFT.

In order to prevent the water contained in the layers of basalt and drift overlying the bedrock from entering the shaft, the practice of "puddling up" was adopted at Ballarat West. This practice, once common on the field, is now almost forgotten, but, as the shafts for working the Albion line of lode had, of necessity, to adopt the system and as a number of difficulties had to be contended with in the case of the Central Plateau Extended Company's shaft, an outline of the method is given.

At Ballarat West there are several water-levels. The uppermost or temporary water-level is practically the surface during winter months. At the base of the first and second rocks the vesicular or honeycomb basalt overlying the clay is heavily charged with water though the intervening strata are frequently dry. In the third rock is the permanent water-level of the alluvium of the plateau; while the quartz mines were at work, this was about 220 feet from surface (*e.g.*, at the South Star mine) but since operations ceased in the deeper levels the water has risen to within 170 feet of the surface.

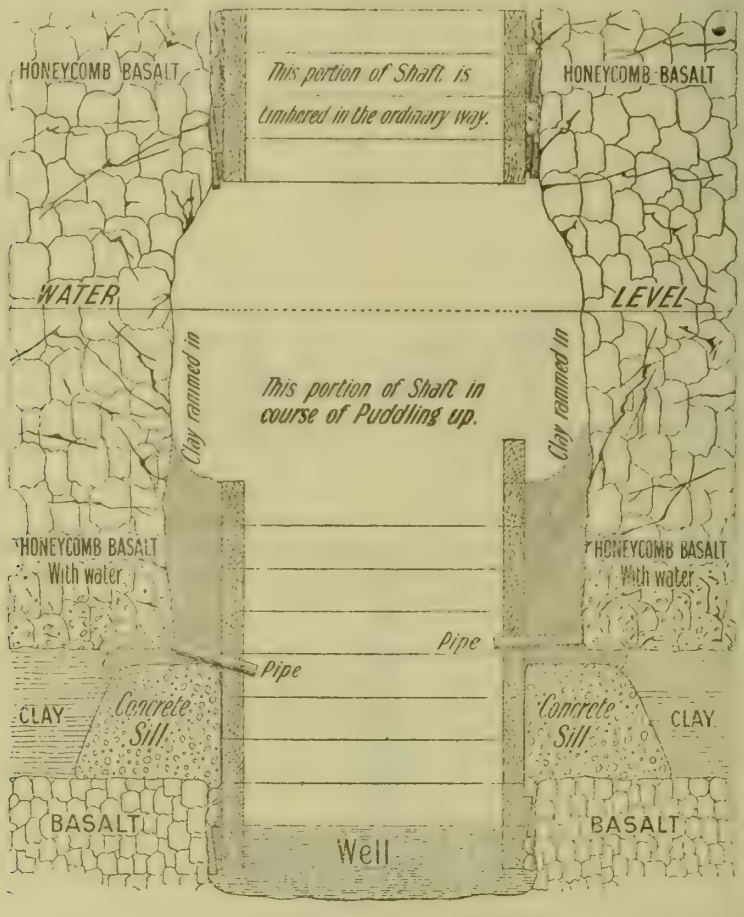



FIG. 17.

The strata pierced by the shaft of the Central Plateau Extended Company consisted of layers of basalt with intervening sands, gravels, and clays. The four-compartment shaft, measuring 14 ft. by 4 ft. 6 in. in the clear was sunk through the basalt and timbered in the ordinary way (timber 8 in. x 3 in.) down to water-level at 95 feet.

Below water-level the rock was excavated sufficiently to admit of about 1 foot of clay being placed behind the shaft-timber when in position, but no timber was placed in this portion of the shaft until the basalt was sunk through and what appeared to be a good foundation for the puddling was reached at a depth of 108 feet. At this depth a concrete sill, 14 in. x 14 in., was set around the shaft; in most of the mines a timber frame was used instead of concrete. When the concrete had set, a set of shaft timber was placed in position above that already fixed in the concrete and behind this timber specially selected and well worked clay was rammed by means of large wooden mallets until the space between the timber and the rock, clay or drift was made impervious to water; clean sand was sometimes used instead of clay and by some miners it was considered better as it was not melted away by the water. Before the clay was rammed in, the positions of any running streams of water were located and holes were bored through the shaft-timber opposite these points and pipes of about 1½-in. bore were inserted. The pipes were so placed that the stream of water passed direct into the shaft without wetting the surface of the clay. Further sets of timber were placed in position and clay was rammed in behind them until the shaft was built up to a height of several feet above water-level. In the case of the Central Plateau Extended shaft eight pipes of 1½ in. diameter were inserted through the timber at the base of the pudding to take off the water while the work was in progress. The timber used for the shaft sets was 8-in. by 4-in. hardwood with the top and bottom edges dressed true, and a piece of 3 in. by 1 in. red pine was fastened on top in order to make a perfectly watertight joint when the wood became moistened. When the puddling was completed the pipes were withdrawn by means of a hooked rod and lever, and an oregon pine plug was inserted in the hole and

driven in securely. While the puddling was in progress the water issuing from the pipes had to be watched, as any signs of clay coming with the water had to be stopped. Immediately this was noticed the pipe had to be withdrawn and a pine plug inserted.

After the withdrawal of the pipes the shaft should be watertight but such a condition was seldom attained at once and the following method of overcoming this difficulty was adopted:—Clay caulks of about 1½ in. diameter were cut by means of a special tool from a layer of well-puddled material 8 inches in thickness. These caulks were sun-dried or dried on the boiler until they were sufficiently hard to withstand handling. Wherever a sign of a leakage was manifest in the shaft an auger hole was bored through the timber at an angle of about 10 deg. from the right angle, and the clay caulks were then inserted into these holes and driven in, first with a wooden rammer struck by a heavy hammer and afterwards with an iron rammer driven by a 12-lb. hammer until the compacted clay became as hard as stone. A wooden plug was then inserted into the hole in the timber. This procedure was followed until all leakage ceased.

At the Central Plateau Extended mine two sills gave way owing to the nature of the material in which they were embedded, but a third sill of 20-in. concrete at 128 ft. 6 in. from the surface set in basaltic clay, enabled the water to be taken up satisfactorily.

Below the clay in which the lowest sill was placed was a layer of basalt but this carried little water and caused no trouble.

### RAISING WATER.

To take the water out of the shafts buckets were at first used; these were made of timber or at times green hide with iron rings and were raised either by windlass, horse-works, or engine power. With deeper shafts tanks of rectangular section more nearly fitting the shafts were used, either attached under the cage or inside the cage like a truck. Pumps were early employed, the type most in favour being the Cornish drawlift and plunger. With a few exceptions, such as the Band of Hope, Great North West, and City of Ballarat shafts, the amount of water encountered, though troublesome, was never large.

For sinking, except in drift where the sand choked the valves, the pumps followed as the work proceeded.

In size the lifts varied from 10 in. to 15 in. with a stroke of from 4 feet to 10 feet. While sinking or removing water after flooding the rate of travel was frequently high, cases being recorded of 120 feet and over per minute.

At the shaft of the Great North West Company, in 1865, a beam-engine with a single-acting cylinder 40 inches in diameter with a stroke of 9 feet, worked a pump with an 8-ft. stroke, while another beam-engine with a double-action cylinder 32 inches in diameter and with a 4-ft. stroke running 35 strokes per minute was geared to a pump with a 7-ft. stroke. To a depth of 210 feet, 18-in. plunger pumps were used; below this to a depth of 300 feet drawlifts of 21½ and 18½ inches diameter were employed. Three boilers supplied the steam necessary and water at the rate of 2,000 gallons per minute was pumped without beating the flow prior to the company ceasing operations.

In 1863 the pumping engine of the United Extended Band of Hope Company's No. 1 shaft was of the Cornish beam-engine type. The cylinder was 30 inches in diameter; the stroke 9 feet; single acting, condensing. The pump stroke was 8 feet, twelve strokes per minute, the plunger being 15-in. diameter supplied with 16-in. drawlifts. The plunger worked to a depth of 200 feet with two drawlifts, one 60 feet below the plunger and a second 125 feet below the first. This plant throwing 30,000 gallons of water per hour failed to lower the water below 350 feet, and a second pumping engine was installed having a 12-in. plunger with a 7½-ft. stroke.

In December, 1866, a large beam-engine of 90 horse-power was erected on this shaft by the United Hand-in-hand and Band of Hope Company and a set of 22½-in. pump workings was put in, at this time being the largest pump in the State, but even this pump was not sufficient to cope with the water struck during 1867 although pumping operations were carried on for two years.

### VENTILATION.

With long drives the necessity for artificial ventilation arose, and notwithstanding a considerable outlay in this direction the air in the mines was bad. Even with shafts of only two compartments one would be utilized for ventilating, serving as an upcast, the partition being close lined and at the surface usually connected by a flue to the smoke-stack of the boilers. At times a furnace was built in underground and the flue connected with the lower portion of the shaft; this procedure though risky seemed to find favour. Pipes to convey the air were at times used and were made of iron or wood. Parallel drives on the same level and connected near the working face were used and at times an upper level connecting the workings with the shaft was made. Besides the furnace, water-jets, fans, and the air-duct, the latter a large air pump, were employed.

### HAULING WASH-DIRT ETC.

The earliest method for the removal of material from underground to the surface consisted in wheeling the dirt in a barrow to the foot of the shaft and loading it into a bucket or "kibble" to be hauled up by a rope or chain by men or horses. When steam power was installed trucks came into use; these were hauled up the shaft by attaching hooks to the four corners and connecting up with the haulage rope. Later a cage or frame sliding in the shaft, at first without guides, came into use; the trucks were run into the cage. A later type of cage had two decks so that two trucks could be raised at the same time; this necessitated the raising of the cage a few feet after the first truck was put in. When larger shafts were used, two trucks could be placed end to end in the cage. The capacity of the trucks ranged from 7 to 12 cubic feet. By constant travelling much material was hauled, especially where the double-decked cages were employed. In 1864, at the Band of Hope Company's No. 2 shaft the daily number of trucks ranged from 400 to 550 per shift or from 8,000 to 10,000 per week. For the half year ending August, 1866, 261,000 trucks hauled yielded 25,414 oz. 18 dwt. 1 gr., valued at £101,854 13s. 5d. At the Kohinoor mine, between April and December, 1869, 296,989 trucks, an average of

423 trucks per shift, yielded gold valued at £52,866 16s. The area blocked out for this quantity was 289,688 square feet. At the Prince of Wales Company, in 1864, the average number of trucks per fortnight was between 15,000 and 20,000, and during 1867, 116,000 trucks per quarter were raised. At the New Sir William Don Company for the quarter ending February, 1868, 104,055 trucks of washdirt raised yielded £35,370 worth of gold. Besides washdirt, mullock from the reef drives was hauled, timber and material was sent down for underground work, and from 150 to 200 men went up and down daily.

### WASHDIRT.

The auriferous washdirt consisted of detrital material more or less transported, concentrated, or re-arranged. Evidence of the varying conditions of deposition may be seen in the portion of the field not covered by basalt; where protected and hidden by the basalt flows such features probably exist in a more marked degree, thus forming shallow ground, reef wash, deep leads, and crab holes. Owing to concentration by streams, probably assisted by marine agency during some part of its formation, the washdirt carried most gold where it formed "reef washes" and deep leads. The reef washes are widespread deposits which show little evidence of river action and through which the streams that formed deep leads cut their channels. On account of the fairly level nature of the "reef wash" and the gradient of the deep leads, the difference in level between the two formations ranged from 10 feet to 200 feet. On the flanks of the deep leads, between the deep ground and the reef wash, auriferous wash was found in some places.

In the deep leads the wash varied from a few inches to upwards of 10 feet thick; it consisted of quartz gravel, pebbles, and boulders of all sizes mixed with sand and clay and frequently contained pieces of fossil timber in various states of preservation. The reef washes also varied in thickness and consisted chiefly of well waterworn quartz stones and conglomerate ("cement") boulders, remnants of a previous siliceous deposit which had been broken up and waterworn. The widths and other particulars of the washdirt in the various mines will be found in the section of this report dealing with the alluvial mines. The richest ground worked on the field was on the Golden Point gutter, about ¼ mile south-west of the Band of Hope Company's No. 2 shaft, from which in 1868 one day's washing yielded 2,832 ounces of gold, and for a period of 20 weeks ending March, 1868, yielded 39,633 ounces of gold (see pp. 23 & 79).

### TREATMENT OF WASHDIRT.

The gold was separated from the gravels and clays with which it was associated by puddling or washing with water either in a tin dish, cradle, or sluice. At the deep alluvial mines puddling machines worked by horses and later by steam power were employed. Buddles for catching the flour gold were employed at some of the mines, while others relied on canvas "strakes" or "blankets," and it speaks well for the appliances used to know that the gold values left in the *débris* of the deep alluvial mines is practically nil.

Many of the old slum dams have now been covered by a growth of grass, and are no longer recognisable, while in some instances where the mullock heaps have not been disturbed, grass and weeds have obtained a footing and will soon cover and obscure these records of the early alluvial mines.

### PRICE OF GOLD.

Although the gold varied little in fineness, the price paid for it on the Ballarat field fluctuated. In October, 1856, £3 17s. 3d. per oz. was paid, escort and other charges being debited with the balance. By the end of 1856 the price had risen to £3 19s. 9d. A further slight rise was given in 1862, after the completion of the Ballarat-Geelong railway line, the price now being £4 0s. 3d. In 1868, on the abolition of the export duty on gold, the price was increased to £4 0s. 9d. per oz. for alluvial gold.

The smelting loss on alluvial gold varied from ¼ per cent. to 3 per cent., the resulting bar of gold having a fineness of from 23 ct. 2⅝ gr. to 23 ct. 2⅞ gr., that is, it contained from 98.2 per cent. to 98.8 per cent. of pure gold.

### GOLD DISTRIBUTION.

Although the deep leads were easily followed, their gold contents was erratic. This was due to two reasons, first, that the bedrock and also the deposits themselves acted as "ripples" or catchments for the gold and prevented the gold being transported down stream; and, secondly, that certain belts of bedrock were highly auriferous and others poor. The two most striking examples of belts of auriferous bedrock are the Indicator belt, Ballarat East, and the Kohinoor line, Ballarat west. The wash in the vicinity of the Indicator belt yielded the bulk of the large nuggets and the rich returns of the Gravel Pits and Bakery Hill. Further west the leads were poor, but in the vicinity of the Kohinoor and the Hurdsfield rich reef wash and deep lead deposits with numerous nuggets were found. A noticeable feature is that the heavier alluvial gold was found where the gold in the bedrock is confined to spurs and consequently patchy, not in places where the values are evenly distributed throughout the lodes. Along the strike of favorable beds the values were persistent and where the leads were roughly paralled to such belts the production was uniform; but in the leads crossing the strata the values were irregular. This patchiness of the gold, together with the deepening of the channels and heavier water, &c., towards the west caused the leads to be abandoned in that direction, but not before it was proved that payable values existed on some leads ahead of the points where other leads had been abandoned, *e.g.*, on the Park lead to the west of and south of the point where the Inkerman lead was abandoned.

### FUTURE PROSPECTS.

The outlet of the Ballarat West leads is dealt with elsewhere. Unfortunately, no surface indications are available to suggest trend of leads or values. There is a large area within comparatively a few miles of the source of the leads, where no alluvial mining has ever been attempted, and the value of which is unknown.

## DETAILS OF LEADS.

### ASHE'S LEAD.

This short lead was discovered towards the end of August, 1858, by a party, one of whom was named Ashe. Within a month 30 claims were at work. The depth of sinking was about 120 feet and the yield in the prospecting claim was about 3 dwt. to the tub. The average yield for two months' work by the parties on the gold was 2 oz. to the load, although as much as 10 oz. to the load was obtained. There were 20 payable claims on the lead. A peculiarity of the wash-dirt was that gold was rarely or never seen until the stuff was washed. Water for the puddlers was scarce and supplies had to be obtained from Kirk's dam. Twelve months after the lead had been abandoned, a party of boys obtained good returns from crushing cement which they found in the *débris* at the old shafts. Ashe's lead was worked to its junction with the Eureka lead. While prospecting among the old workings at the head of the lead a prospector unearthed a nugget of 107 oz. early in 1910.

### BELLTOPPER GULLY LEAD.

In September, 1859, a rush took place to a gully running from the Golden Point Range to Mt. Pleasant. The ground was shallow and limited in area, but exceedingly rich, and in some places as much as 2 lb. of gold was won from a claim measuring 8 ft. by 8 ft. No definite lead was found, the gold being uniformly scattered.

### CALEDONIAN LEAD.

The Caledonian lead was discovered in June, 1856, by a party of miners working the old ground on the Eureka lead. Their shaft bottomed at 146 feet on wash which averaged 4 dwt. to 5 dwt. of gold to the tub. "Drift," which made mining difficult, was struck in some of the shafts. Early in 1857 one patch of rich ground in the prospecting claim yielded 8 lb. weight of gold; another yielded 4 lb. Though the other claims—some 50 or more—were not as rich as the prospector's, the lead throughout was a noted gold producer during 1857. The prospecting claim yielded about £34,000 to a party of 8 men, and the average yield throughout the lead was estimated at from £200 to £500 per man.

### ESMOND'S LEAD.

This lead was discovered in October, 1856. The prospectors had good returns; a handful of wash-dirt is recorded as yielding 3 dwt. 4 gr. of gold. The gutter in the prospecting claim was 17 feet wide, payable from side to side and carried 2 feet 6 inches of wash. Within a fortnight 82 claims were registered, the average yield was 4 oz. to the tub, but the lead was soon abandoned, as the returns were not considered proportionate to the labour involved in sinking shafts 80 feet to 100 feet deep.

### GAY'S LEAD.

Gay's lead, which was worked in 1856 and 1857, is a tributary of Navy Jack's lead. Near the junction, the lead was over 100 feet below the surface. No. 2 claim yielded £70 per man and Nos. 5 and 6 claims £60 per man for 4 months. Nos. 7 and 8 claims yielded only £40 per share. Nos. 9 and 10 claims amalgamated and gave good returns. Three machines of 20 loads each yielded 19 oz., 29 oz., and 21 oz. respectively, and over 500 loads of wash-dirt from the claim yielded an ounce to the load. Nos. 11, 12, 13 and 14 claims paid about £86 per share.

### GOLDEN POINT AND WATERLOO LEADS.

Waterloo lead is a portion of a tributary of the main lead; below Waterloo lead the main lead is known as Golden Point lead and above as Gravel Pits lead. The Waterloo lead is that formed from the shallow ground at Golden Point.

Waterloo lead was discovered in April or May, 1856, and proclaimed a "frontage" lead shortly after. Claims were laid off in accordance with the regulations of the local court of 12th June, 1856, which allowed 8 men to take up a claim measuring 48 feet along the course of the lead, and which provided that a block of ground 6 ft. wide should be left between adjoining claims. By December, 1856, all the claims from No. 1 to No. 12 had been worked out and the ground was abandoned.

On 28th June, 1856, the Waterloo Company, consisting of 32 men holding claims Nos. 11 to 14, began to sink a shaft at the foot of the hill, 225 feet east of Lydiard-street and 15 feet south of the south side of Dana-street. They reached a depth of 200 feet in three months, passing through 60 feet of basalt ("second rock") and a layer of clay and gravel, but bottomed on shallow ground. A drive towards the gutter was opened out at 220 feet, but it proved too shallow. The shaft was then deepened to 235 feet and the gutter was struck on 10th November, 1856. Downstream the lead junctioned with the Gravel Pits lead and the mine was swamped and steam power had to be used before the water was overcome. The claim was abandoned on 28th July, 1858. The total yield was 6,750 oz., dividends amounted to £19,776 and expenses to £5,824, inclusive of a royalty of £700 to the trustees of the Wesleyan reserve for the right to mine on that property.

The Golden Point or Waterloo gutter was only 25 ft. wide, but below the junction with the Gravel Pits lead the combined lead was fully 100 ft. wide.

The Clarendon, Union and North Grenville companies all began operations in July, 1856, and the Great Eastern in October. Drift was met with in each shaft, but the amount of water that it contained varied according to the depth at which it was encountered. The Clarendon Company, holding claims No. 15, 16, 17 and 18, started shaft-sinking on the south-west corner of Lydiard and Dana Streets in July, 1856, and by the end of the year had reached a depth of 220 feet; at this depth a bed of black clay was met with. The shaft bottomed at 225 feet and was sunk to a depth of 255 feet. A drive was opened out towards the Clarendon hotel and the gutter was struck at a depth of 240 feet below the surface, the lead here was over 100 ft. wide. Steam power was employed for haulage. The gold won was valued at £9,600.

The Union Company of 48 men held blocks Nos. 19 to 24. The shaft, which was sunk midway between Lydiard and Armstrong Streets, at the rear of the Clarendon hotel, passed through 50 feet of basalt and then entered a layer of drift from which at 90 feet a large quantity of slightly brackish water was given out. At 97 feet a bed of clay was struck. At 175 feet the water in the drift was so heavy that steam power was required to cope with it. This drift was not met with in the main shaft of the Waterloo Company, but was encountered in a blind shaft and swamped out

that mine when struck. The shaft was sunk to a depth of 247 feet. The width of the lead varied from 40 ft. to 80 ft. wide with 2 ft. to 5 ft. of wash-dirt. The total value of gold obtained was £13,440.

The Great Eastern Company held claims No. 25 to 30, 48 men's ground in all. Shaft-sinking on the south side of Dana-street, midway between Armstrong and Doveton Streets, began in October, 1856. The strata passed through comprised:—

| Formation. | Thickness. | | Remarks. |
|---|---|---|---|
| | ft. | in. | |
| Basalt ("first rock") .. | 54 | 0 | |
| Wet drift .. .. .. | 10 | 6 | |
| Basalt ("second rock") .. | 35 | 6 | |
| Clay .. .. .. | 12 | 0 | |
| Drift .. .. .. | 8 | 0 | |
| Clay .. .. .. | 65 | 0 | |
| Drift with heavy water .. | 38 | 0 | 11 weeks sinking |
| In bedrock .. .. .. | 32 | 0 | |

The shaft was opened out at 265 feet in May, 1857, and the gutter was struck and gold was found in June, 1857. The total value of gold won by the company was £13,440.

The North Grenville Company held claims No. 31 to 36 inclusive, and sunk its shaft near the south-east corner of Dana and Doveton Streets. The shaft bottomed on high reef at 180 feet after passing through 150 feet of basalt and 30 feet of dry drift and clay; it was continued to 277 feet and a level was opened out at 270 feet in March, 1857. The gutter was found to be about 50 ft. wide with about 4 ft. of wash-dirt, this did not yield well, but better gold was found in the reef-wash, where a layer of wash-dirt 4 ft. thick yielded well. A total output valued at £28,000 was obtained from this mine, which took 3 years to work out.

The Grand Junction Company, which held claims 36 to 40 inclusive, began shaft-sinking in August, 1856, between Doveton and Dawson Streets, south of Dana-street. The strata passed through consisted of:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt ("first rock") .. .. .. | 60 |
| Drift .. .. .. .. .. | 30 |
| Clay .. .. .. .. .. | 50 |
| Basalt .. .. .. .. .. | 60 |
| Clay and drift .. .. .. .. | 40 |
| Bedrock .. .. .. .. .. | 50 |
| Total depth .. .. .. | 290 |

Trouble arose in the shaft owing to the breaking of the puddling in the second rock. Before the mine closed down in November, 1858, 2,891 oz. of gold had been won and £9,038 had been paid to the shareholders.

It was soon apparent to the miners that claims as small as those allotted to the above companies could yield little, if anything, more than wages, and an attempt was made to secure larger areas where, owing to the increasing difficulties to be contended with, a considerable length of time would be required to work them out.

New regulations giving larger areas came into force in January 1857, but several parties that had begun to work their claims would not abandon their smaller areas. To overcome any trouble that might arise, an area of three claims comprising 384 feet in length was marked out and reserved to the companies already working the smaller claims. This block was held by a company called the Extension, which included a representative appointed from each of the smaller claims, viz.:—the Waterloo, the Clarendon, the Union, the Great Eastern and the Grenville companies, and comprised 388 shareholders.

The United Extension Company was formed early in 1857 by the holders of claims Nos. 11 to 35, to take advantage of the increased length of ground allotted under the new regulations to companies which proposed working the deep alluvial leads. The regulations were made retrospective, but the owners of claims Nos. 11 to 35 had already sunk their shafts to considerable depths and in some cases had reached the wash before the new regulations came into force; they were therefore loath to forego their claims in order to take up larger ones under the new law. To get over this difficulty they marked off 384 feet along the lead below No. 35 claim (a length equal to the sum of the additional pieces to which they were entitled) and worked it jointly. The company consisted of 388 shareholders, including a representative of each of the former parties.

Work began in January, 1857: the shaft site was 52 feet east of Lyons-street and 39 feet south of Eyre-street. The strata passed through comprised:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (first rock) .. .. .. .. | 80 |
| Clays, &c. .. .. .. .. | 30 |
| Basalt (second rock) .. .. .. | 59 |
| Clays, &c. .. .. .. .. | 11 |

The shaft, which bottomed in high reef at 180 feet, was sunk to 295 feet before a level was opened out for the gutter, which was found to be 70 ft. wide. The company experienced much difficulty in coping with the water in the deep ground, and the mine was swamped out twice with water from the drift overlying the wash. By October, 1858, the main drive was completed and the lead was opened up. The average gold content of the lead was very good and some returns were as high as 80 oz. to the machine. From 2 feet to 3 feet of wash-dirt was taken. The total value of gold won was £7,688.

The Homeward Bound Company held 5 claims, which entitled it to 456 feet along the lead; 40 men worked the ground. A shaft was begun early in 1857, near the south-east corner of Raglan and Eyre Streets. The strata passed through consisted of:—

| Formation. | Thickness. | |
|---|---|---|
| | ft. | in. |
| Basalt (first rock) .. .. .. .. | 78 | 0 |
| Stiff Clay .. .. .. .. | 17 | 6 |
| Sandy Clay .. .. .. .. | 19 | 6 |
| Basalt (second rock) .. .. .. | 54 | 0 |
| Drift .. .. .. .. | 40 | 0 |
| Basalt (third rock) .. .. .. | 50 | 0 |
| Red clay .. .. .. .. | 26 | 0 |
| Black headings .. .. .. .. | 10 | 0 |

The shaft bottomed on auriferous wash within 45 feet of the gutter.

This company was the first on the Golden Point lead to meet with the third layer of basalt. The drifts between the rocks were the most troublesome

yet encountered on the plateau and nearly two years were spent in sinking the shaft. The gold won was valued at £11,760.

The New Constitution Company holding 5 claims of 148 feet each, consisted of forty shareholders. A shaft-site was selected near the corner of Eyre and Errard Streets, on the supposed course of the Golden Point lead, and shaft-sinking began early in 1857. The strata passed through consisted of:

| Formation. | Thickness. |
|---|---|
| | feet. |
| Clay and basalt (first rock) .. .. .. | 78 |
| Clay .. .. .. .. .. | 10 |
| Drift .. .. .. .. .. | 26 |
| Clay .. .. .. .. .. | 10 |
| Basalt (second rock) .. .. .. | 20 |
| Drift .. .. .. .. .. | 10 |
| Clay .. .. .. .. .. | 18 |

The shaft was bottomed at 182 feet, but this was considered too shallow, and it was abandoned. No. 2 shaft was then sunk north of the north-east corner of Errard and Urquhart streets, passing through:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| Clay .. .. .. .. | 10 |
| Basalt (first rock) .. .. .. .. | 72 |
| Clay .. .. .. .. | 12 |
| First drift .. .. .. .. | 24 |
| Clay .. .. .. .. .. | 10 |
| Basalt (second rock) .. .. .. | 24 |
| Second drift .. .. .. .. | 14 |
| Sand and clay .. .. .. .. | 10 |

It bottomed at 176 feet and was then sunk to 320 feet. At 317 feet 6 inches from the surface a drive put in 480 feet in a north-westerly direction failed to reach any deep ground; and another, driven due east through hard country, met the gutter at 500 feet from the shaft, at a point where the lead turned from the southerly course that it followed in the Homeward Bound mine, and ran easterly. Downstream the workings of the Great Western Company (which was registered for the Nightingale lead) were broken into, and subsequent operations raised legal questions and resulted in several of the mines being worked by the Court of Mines, which divided the profits among the various owners. The average width of the gutter was about 40 ft. and the wash-dirt consisted of 3 ft. to 6 ft. of loose, black gravel resting on a hard bottom. The mine was worked out early in 1860. The gold won was valued at £8,799 3s 9d, and dividends amounted to £7,602. Ventilation in this mine was effected by means of a furnace installed below. A pump was also in use.

### GRAVEL PITS LEAD.

The Gravel Pits lead, on the east side of the Yarrowee Creek, spread over a width of about 5 chains, with gold scattered throughout. The lead to near this point had been proved to be rich, small claims which measured 48 feet by 24 feet turning out between £60 and £70 per man. When the lead was followed towards the deeper ground a layer of basalt (the second rock) was met with near the course of the creek; this was the first place in Ballarat where basalt was encountered in deep sinking for alluvial. From just above this point steam power was necessary to cope with the water in the lead.

In October, 1855, a party secured from Mr. Thomas Bath the right to sink a shaft at the south-west corner of Sturt and Lydiard Streets to prove the continuation of the deep ground under the basalt plateau

In March, 1856, the Little Engine Company (Smith's party of fifteen men), began operations near the foot of the hill on the north side of Sturt-street. The shaft passed through about 47 feet of basalt and bottomed in the gutter at a depth of 220 feet in October, 1856. The gutter was 20 ft. wide and carried wash-dirt from 4 ft. to 6 ft. thick right across; and on either side of the gutter was reef-wash 70 ft. wide. The gutter yielded from 20 oz. to 30 oz. and the reef-wash 8 oz. to 17 oz. to the machine. The claim was worked out and abandoned by January, 1860, after 7,800 oz. of gold had been won and dividends amounting to £24,960 had been paid.

The Big Engine Company, whose claim was situated north of the Little Engine claim, sank a shaft at the foot of Camp Hill, bottoming in December, 1856, and drove towards Lydiard-street. It was not so successful as the Little Engine Company and ceased work in July, 1859.

Bath's party sank their shaft through 100 feet of basalt, opened out on the north side of the shaft at 250 feet from the surface, and struck the gutter under Sturt-street during December, 1856; the ground here proved very rich. This, and the success of the Big and Little Engine parties, stimulated the search for deep leads beneath the plateau. The gutter was found to be 150 ft. to 200 ft. wide with 4 ft. to 5 ft. of dark-coloured wash-dirt, overlain by a black clay that resembled decomposed vegetable matter and contained the remains of trees in places. This company followed the lead westerly and around a southern bend towards the old Gravel Pits Company's claim. From 650 feet along the lead the company won £17,000 worth of gold.

The Old Gravel Pits Company (72 men) held 1,800 feet along the lead and sank two shafts between Lydiard and Armstrong Streets on the north side of Dana-street. The No. 1 shaft, begun on 21st November, 1856, passed through:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| Clay } (newer drift) .. .. .. | 3 |
| Brown clay } | 11 |
| Basalt (first rock) .. .. .. .. | 45 |
| Clay .. .. .. .. .. | 10 |
| Drift .. .. .. .. .. | 2 |
| Clay .. .. .. .. .. | 8 |
| Basalt (second rock) .. .. .. | 85 |
| Brown clay .. .. .. .. | 8 |
| Light coloured clay .. .. .. | 3 |
| Drift .. .. .. .. .. | 35 |
| Light clay .. .. .. .. | 5 |
| Brown clay .. .. .. .. | 12 |
| Black clay .. .. .. .. | 15 |
| Bedrock .. .. .. .. .. | 15 |

It took 5 months to sink this shaft. No. 2 shaft, north-east of No. 1 shaft, bottomed on reef-wash at 231 feet after 3½ months' work. The yield from the wash-dirt, which was from 3 ft. to 9 ft. thick, varied from 10 dwt. to 14 dwt. to the load. In two years the working expenses of this company amounted to £9,819. In August, 1859, the company was wound up and the mine was purchased by a new party who reworked the old ground, with only Bath's and the North Grenville mines at work in the neighbourhood, until February, 1860. The lead was traced from Bath's mine southerly to No. 1 shaft, thence south-easterly to its junction with the Waterloo lead, under the Wesleyan reserve, where the workings of the Waterloo Company were broken into; the combined lead was known as the Golden Point lead.

From July, 1857, to February, 1859, the gold yield was 8,865 oz., and the dividends £28,080, amounting to about £4 per man per week.

### INKERMAN LEAD.

The Inkerman lead was worked at its head in Inkerman Gully, north of the Black Hill, early in 1854, and was followed downstream until it was 50 feet to 60 feet below the surface, where, owing to increase in the quantity of water and the poor quality of the wash, the lead was abandoned. In March, 1857, a prospecting party, Gupe and others, took up a claim on the eastern edge of the basalt, near the present railway line to Creswick, and struck the wash in July of that year at a depth of about 100 feet. The wash yielded only 2½ oz. to the machine. At the same time another party, Wasley and Co., prospecting to the westward, struck a lead, the A1, which junctioned with the Inkerman lead and proved not only to be rich itself, but to enrich the Inkerman. After paying all expenses the prospectors of the A1 lead divided £3,200. The Junction Company on the A1 lead obtained £7,200 clear in 10 weeks after paying all expenses, but the claims upstream from the prospector's did not yield well. The Homeward Bound Company on the A1 lead between the prospectors and the Inkerman lead, paid £14,800 in dividends. In this claim a tributary, called Bridget's lead, was traced to its source on the Cemetery line of reef; it was narrow and quite dry, and the wash-dirt was brownish yellow and difficult to puddle.

On the Inkerman lead, below the junction of the A1, the Criterion, the Hope, the Ballarat, the Great Northern, and the North Star Companies were at work in 1857. Much of the land being freehold, the frontage system of claims did not apply, and arrangements had to be made with land-owners for the right to mine on their property. The first company to make these arrangements was the Allied Armies Company in Greene's paddock; the Freehold, the Montezuma, the Unicorn, the Independent, and the Ophir Companies following in quick succession.

The Great Northern Company on the eastern side of the Creswick road, south of Macarthur-street, had considerable difficulty in 1857 and 1858 in sinking its shaft, and after overcoming difficulties with water, and opening up the wash in 1858, the returns were variable. In April of that year two machines, yielding 35 oz. and 48 oz. respectively, were washed, and dividends of £17 per week were paid, but in October the dividends had fallen to £2 or £3 per week, and the yields at times were as low as 15 dwt. to the machine. Over 1,000 feet of driving along the lead was undertaken by this company, whose total yields are not available.

By January, 1858, a zig-zag line of claims extended from the Creswick-road to Sturt-street, on either side of Drummond-street. A large amount of capital was invested in the best available machinery. Shaft sinking was in progress in many of the mines. The Haphazard Company, on the western side of Drummond-street, was on gold in a tributary lead. By the end of 1858 the Inkerman was the best paying lead on the Ballarat field Swamping out of the mines was common, and caused considerable delays. The Allied Armies, the Independent, the Ophir, and the Great Republic Companies were on good gold by the beginning of 1859, while the Hand-in-Hand, the Royal Saxon, and the Leviathan Companies were shaft-sinking and prospecting for the down-stream portion of the lead. In June, 1860, the following particulars were given of the mines on the Inkerman lead:—

| Companies. | Men Employed. | Month's Yield. | Average weekly Dividend per Share. |
|---|---|---|---|
| | | oz. | £ s. d. |
| Allied Armies .. | 100 | 716 | 7 10 0 |
| Ophir .. | 64 | 284 | 4 5 0 |
| Independent .. | 58 | 560 | 9 10 0 |
| Republic .. | 80 | 666 | 9 0 0 |
| Hand in Hand .. | 80 | 628 | 8 0 0 |

### LADY BARKLY LEAD.

The Lady Barkly lead was discovered in July, 1856, about the same time as the Caledonian lead was attracting attention, by the miners who were endeavouring to locate that lead. In January, 1857, payable ground was struck, prior to which the prospectors had sunk two shafts with great difficulty, and had driven a considerable distance without success. The lead was proclaimed on 27th January, 1857. The depth of sinking was a little over 100 feet, and a prospect of 1 oz. of gold was washed from three buckets of dirt. By March, 1857, though eighty claims were at work, few found payable ground. By the end of March, 1857, the lead was almost abandoned as many shafts were unsuccessful, and the prospecting claim merely paid wages up to the time of working out.

### MALAKOFF LEAD.

The Malakoff lead was discovered in August, 1856, and shortly afterwards was proclaimed a frontage lead. By November of that year, eighty claims were registered, and the prospecting claim was still getting good wash. Nos. 1 and 2 claims had to sink through basalt. The yields were 20 oz. per share.

The Wild Duck Company's claims, Nos. 3 and 4, bottomed shallow, and had to drive for the gutter. The company took out 15 lb. weight of gold, and then sold the claims and whim for £120 to the owners of claims Nos. 5, 6, and 7. The lead was very narrow, and dipped fast to the claim of the West Malakoff Company, in which the junction of the lead with the Golden Point gutter was struck in March, 1857, and drives were put in east in 1858. A drive in the direction of the Britain Company's claim struck good wash, yielding as much as 15 lb. weight to the machine. From the time of striking the lead to 15th October, 1858, when the monthly dividend was £49, the West Malakoff Company divided £200 per share. The company consisted of seventy-seven shareholders.

The parties working Nos. 5, 6, and 7 claims amalgamated, and put in two drives and two blind shafts, but were beaten by the water. They then abandoned the claims, which became the property of the Great Britain Company. In the second rock at 100 feet from the surface, the Great Britain Company met with so much water that a pumping plant was required. At 132 feet, 260,000 gallons of water were pumped out daily, and this, after a time, reduced the water level in the adjacent mines.

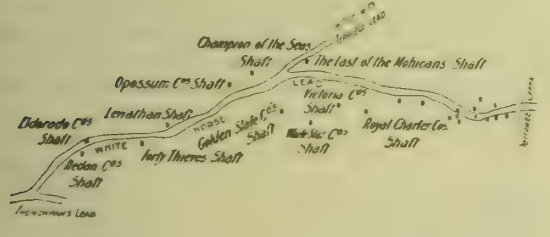
During 1860, the Triumphant Company worked out the gutter by July, and failed to discover payable ground by driving on the reef at 20 feet

to 30 feet above the gutter, but another drive at a higher level penetrated wash-dirt, which yielded rich specimens. This wash averaged 30 oz. to the machine, and, being at a high level, contained very little water. The Triumphant Company worked the claim formerly owned by the West Malakoff Company, and got more gold from the reef-wash than the former owners got from the gutter.

### NIGHTINGALE LEAD.

This lead, which was proclaimed a frontage lead about the end of 1856, was traced across the White Flat and under the basaltic plateau, where the All Nations Company sank a shaft on the brow of the basalt escarpment. The gutter was reached by this party early in 1858, and was worked out by October, and the party then directed its attention to the reef-washes. The gutter yielded from 8 oz. to 50 oz. to the machine, the average throughout being 15 oz.

The Telegraph Company, adjoining the All Nations Company, reached the gutter towards the end of 1857, and its first machine yielded 6 lb. weight of gold. In this claim the lead was found to junction with the Golden Point lead, and this resulted in litigation with the West Malakoff Company.




### RED HILL LEAD.

The Red Hill gutter was poor, and did not pay expenses, but the alluvial in the vicinity of the Indicator line on the south bank was rich. On this reef-wash was situated the famous Durham Hole, from which an almost fabulous quantity of gold was taken. The claim was 24 feet square. The first party of eight men took out 936 oz. of gold; a second party of eight men, 2,304 oz.; a third party of twelve men, about 9,000 oz., up to 22nd December, 1856, making a total of 12,240 oz., worth nearly £50,000.

### WHITE HORSE LEAD.

The shallow part of this lead was worked early in 1854 from its source on the White Horse range westerly towards the Yarrowee, and was abandoned before deep ground under the basalt was reached The upper portion of the lead had a steep fall, and the gold was found in the crevices or ripples in the bedrock. In May, 1856, the deep ground was registered for about 100 claims, which extended from near the Yarrowee Creek westerly to the private property of Winter's estate. Owing to the difficulty in sinking through the basalt and drifts, a number of the claims amalgamated, and sank shafts conjointly. In claims Nos. 8 to 10 a prospect of fine gold was obtained from the drift between the first and second layers of basalt. This was tested later, but was unpayable. The junction of the White Horse with the Terrible lead was found in the claims of the White Star Company (Nos. 20 to 22). These claims yielded 3,952 oz. of gold. The Champion of the Seas, Nos. 25 and 26, yielded 4,212 oz. of gold, but the records of the other claims, as far as the Red Jacket Company (Nos. 65 to 82), are not available. In claims Nos. 40 to 44, on this lead, the junction of the Frenchman's and White Horse leads was struck. (Figs 7, 8.)

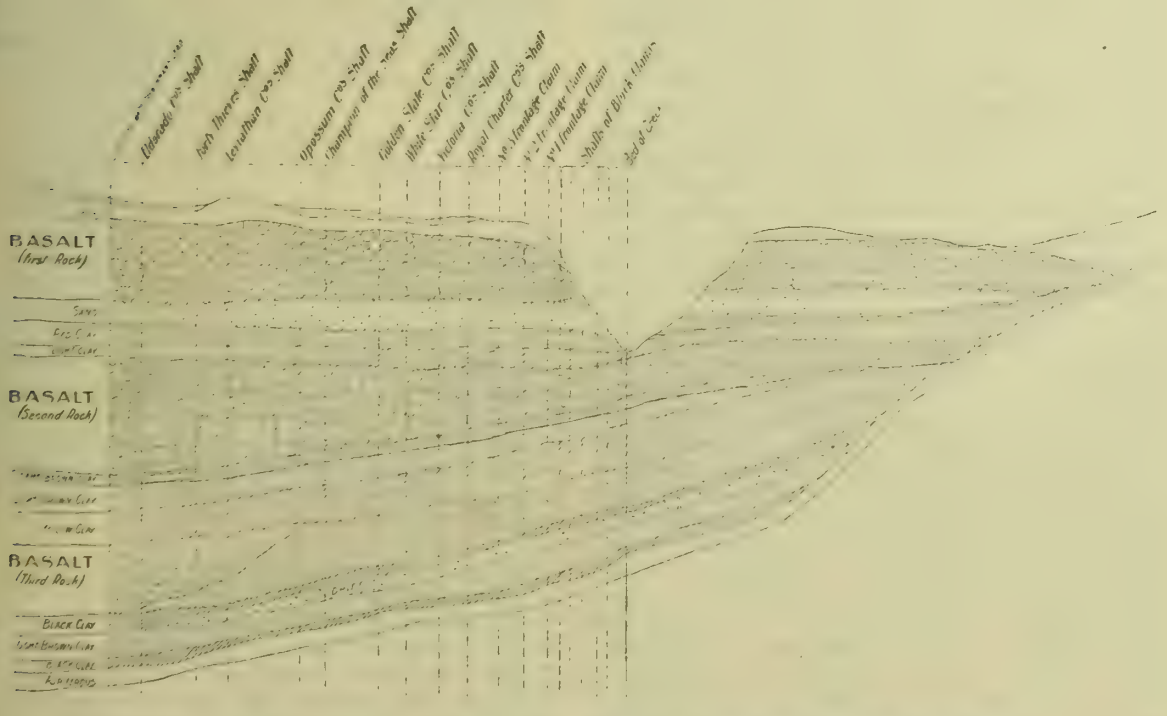



FIG. 18. Plan and section of a portion of the White Horse Lead, from plan dated 13.9.1859.
Horizontal scale :—845 ft. to 1 in. Vertical scale :—128 ft. to 1 in.

## ALLUVIAL MINES.

### ALBION COMPANY.

The Albion Company, a co-operative party of seventy-two shareholders, held claims Nos. 115 to 122 on the Frenchman's lead. The ground was taken up in January, 1857, and boring began in the following March. Boring was continued for twenty months, and proved about 1½ miles of territory between the last claim at work on the lead and the boundary of Winter's pre-emptive right. The first bottomed at a depth of 133 feet, and the whole of the bores were remarkably shallow, twenty-three aggregating 5,000 feet, and the deepest being 320 feet. Shaft-sinking near the deepest bore began on 4th October, 1858. The shaft was 9 ft. 4 in. by 4 ft. in the clear, and was regarded as of very large dimensions. Sawn planks 5½ inches thick were used for timbering the shaft. From the inception of this company a systematic method of working was adopted. For sinking the shaft a complete pumping and winding plant was erected. A flat iron-wire rope was used for hauling. By August, 1859, the shaft had reached a depth of 225 feet, the costs to that date being about £5,000. By the end of 1859, the shaft had been bottomed, and carried down 50 feet into the bedrock. The strata passed through in this shaft consisted of:—

| Formation. | Thickness. feet. |
|---|---|
| Clay .. .. .. .. .. | 5 to 7 |
| "First rock" (basalt) .. .. .. | 93 to 98 |
| Baked clay .. .. .. .. | 3 to 8 |
| "Second" and "third" rocks (basalt) .. | 155 to 156 |

Bottomed at about 264 feet.

The shaft was sunk to a depth of 470 feet and a prospecting drive was opened out eastwards N. 72½° E., at 457 feet from the surface. At 400 feet from the shaft a bore from the roof of the drive failed to locate the deep ground. Early in 1861, highly inclined prospecting drives were put in, at a point 420 feet from the shaft, the incline rising 64 feet in 100 feet. At 312 feet from the shaft, an incline drive was put in to the south-west for a length of 130 feet, rising 50 feet in that distance. At this point the washdirt was reached on 9th November, 1861, after nearly five years of dead work, during which time about £12,000 had been called up. By the end of 1861, 184 oz. 9 dwt. 19 gr. of gold, including a nugget of 13 oz., was obtained. Prior to striking the gutter, only half the shareholders were required to be at work, but from that date onwards the full complement (seventy-two men) was engaged. The machinery consisted of winding engine with a 20-inch cylinder and 3-feet stroke, working a flat rope 7 inches wide, and weighing 1½ tons: pumping engine, 24-in. cylinder, 4-ft. stroke: pumps, 13-in. plunger to 335 feet, and draw lift a further 135 feet. The pump was worked on a 7-ft. stroke at ten strokes per minute. In January, 1862, the mine was swamped, and several months elapsed before work was resumed. A new level was opened out from the main shaft at 437 feet, 20 feet above the former main level, and by means of this the lead, which was called the Bulls Run by the company, was worked. The lead was proved to have a zig-zag course, first north-westerly, then westerly, and afterward southerly in a length of 4,200 feet. The washdirt was 4 ft. to 5 ft. thick, and varied from 100 ft. to 500 ft. in width, averaging nearly 300 feet. The Woolshed lead was followed up-stream as far as the St. George Company's workings, and down-stream for a total distance of about 1,000 feet. This lead is north of, and for some distance parallel to, the main lead, and is at about the same level. The richest ground was found 8 feet to 10 feet above the gutter, the best gold being got on the eastern side. In 1865, a main drive was started west of the shaft, and No. 2 shaft was begun. The No. 2 shaft passed through a layer of drift between the third and fourth rocks at a depth of from 254 feet to 273 feet. The fourth rock was quite dry, and the bottom was reached at 343 feet with 6 feet of wash-dirt, which yielded 51 oz. 1 dwt. of gold from the shaft. In 1867, this shaft was transferred to the Prince of Wales Company. The Albion Company in 1864 re-organized with a capital of £161,175 in 6,447 shares of £25 each, £18 5s. being paid up at date of registration. The actual capital subscribed by the original co-operative shareholders was £9,847, about £138 10s. per share (seventy-one shares), and the co-operative company divided £9,880, or £280 per share. With the arrangements made on transferring the No. 2 shaft to the New Prince of Wales Company, 3,223 shares in the Prince of Wales Company were handed over to the Albion shareholders, while an area between No. 1 and No. 2 shafts was made common property between both companies in a claim of 6,448 shares equally divided. This ground was later secured by the Australasia Company (see p. 75). No. 1 shaft, and an area bounded on the east by the St. George, the line fixed by the Court of Mines, north by the Smythesdale-road, west by Winter's freehold, and south by the Working Miners' shaft, was retained by the Albion Company. Throughout 1867, regular yields were obtained, which increased towards the end of that year. The table below gives some idea of the quality of the wash treated within the claim during the latter part of 1867 and early part of 1868:—

| Period. | Gold Won. oz. dwt. gr. |
|---|---|
| Fortnight ending 14.11.67 .. .. | 1,269 10 0 |
| Fortnight ending 30.11.67 .. .. | 1,462 13 0 |
| Fortnight ending 16.12.67 .. .. | 1,450 11 0 |
| Fortnight ending 31.12.67 .. .. | 3,531 18 0 |
| Fortnight ending 14.1.68 .. .. | 2,759 7 0 |
| Fortnight ending 28.1.68 .. .. | 2,593 14 12 |
| Fortnight ending 15.2.68 .. .. | 3,112 12 0 |

The returns from the Albion Company prior to amalgamation with the Band of Hope Company were:—

| Period. | Gold Yield. oz. dwt. gr. |
|---|---|
| 1861 .. .. .. .. | 184 9 10 |
| 1862 .. .. .. .. | 1,404 16 0 |
| 1863 .. .. .. .. | 6,602 6 5 |
| 1864 .. .. .. .. | 4,115 15 5 |
| 1865 .. .. .. .. | 11,362 16 0 |
| 1866 .. .. .. .. | 21,441 15 23 |
| 1867 .. .. .. .. | 29,485 11 0 |
| 1868 .. .. .. .. | 11,833 0 0 |

In March, 1868, the Albion Company amalgamated with the United Extended Band of Hope Company, and formed the Band of Hope and Albion Consols Company. The gold won by the Albion Company to the date of this amalgamation amounted to 84,324 oz., and the dividends paid to £153,391 15s.

### ALLIED ARMIES COMPANY.

This company of 100 shareholders was formed in 1857 to work a portion of the Inkerman lead in some private property known as Greene's paddock, on the eastern side of Drummond-street and north of Webster-street. The first shaft was situated in the north-eastern corner of the paddock near the Creswick-road. The gutter at this point

was 180 feet from the surface, and on the south side of the shaft. It was 100 ft. wide, and the washdirt was 3 ft. thick. A second shaft, towards the south-western part of the claim, was started towards the end of 1857, and was sunk to a depth of 210 feet. The drive for the lead was over 1,200 feet in length, as the gutter lay outside the freehold allotment, and to the west of the shaft. A drive northerly proved the lead to leave the claim on the north-eastern side of the intersection of Mill and Drummond streets, and near this point a small basin or lake, about 3 acres in extent, was found to contain 30 ft. of payable washdirt, which was stoped out in layers. The reefwash on the sides of the gutter was found to be more profitable to work than the deep ground. From 1857 to 1860 weekly dividends of £5 to £10 per man were paid. In 1860, the shareholders in the No. 2 shaft sold out their interest to the party in No. 1 shaft at £100 per share, and the number of shares was reduced from 101 to 52. In August, 1862, the company abandoned the claim after several months profitless work in the vicinity of the gutter. Shortly afterwards, the area was taken up by the Emerald Company, who proposed working the quartz reefs within the area.

The gross yield obtained by this company was over £120,000 worth of gold.

AUSTRALASIA COMPANY.

This company was formed in 1866, and held an area south of and adjoining the Albion Company. In December, 1866, shaft sinking on contract was begun at a site opposite the north-west corner of the Bonshaw pre-emptive right. The shaft was 9 ft. 3 in. by 3 ft. 8 in., and was divided into three compartments, and the price of sinking was £8 5s. per foot to bottom. In March, 1867, operations were suspended at a depth of 141 feet. This shaft was later on used by the Albion Consols Company.

ALBION CONSOLS COMPANY.

This company was formed towards the close of 1868, and operations were begun in the Australasia Company's shaft. In May, 1869, the shaft was bottomed at a depth of 210 feet, the strata passed through being:—

| Formation. | Thickness. feet. |
|---|---|
| "First rock" (basalt) .. .. | 52 |
| Clays and gravel with much water .. | 11 |
| "Second rock" (basalt) .. .. | 73 |
| Clay .. .. .. .. | 5 |
| "Third rock" (basalt) .. | 35 |
| Clay .. .. .. .. | 30 |

Shaft sinking from a depth of 210 to 250 feet cost £2 10s. per foot. A level opened out at 240 feet broke through into black clay at 60 feet from the shaft. An incline drive met the fourth rock with much water within a few feet of driving, and the shaft was deepend to 331 feet, and was opened out at 321 feet from the surface. In 1870, bores put up above the lower level proved washdirt at a depth of 280 feet from the surface, and this was reputed to contain payable gold, but no particulars of further work are available.

BALLARAT FREEHOLD COMPANY.

This company was formed in April, 1866, to work a block of 36 acres of freehold land bounded on the north by the Newington Freehold and the Southern Freehold Companies, on the south and west by the Hand and Band Company, and on the east by the Kohinoor Company. The claim was situated on the western side of Pleasant-street, near the end of South-street. Two shafts were sunk, the strata passed through in No. 1 shaft being:—

| Formation. | Thickness. feet. |
|---|---|
| "First rock" (basalt) .. | 120 |
| Sand and clay .. .. | 42 |
| "Second rock" (basalt) .. | 26 to 34 |
| Sandy clay .. .. | 25 |
| Coarse drift .. .. | 34 |

This shaft bottomed at a depth of 251 feet on bedrock, dipping rapidly to the north-west. From the bottom of the shaft 2 oz. of gold was obtained. In sinking, much water was encountered in the drift below 220 feet from the surface, and piling had to be resorted to.

No. 2 shaft passed through strata similar to that met in No. 1, and was bottomed at 245 feet on soft sandstone. In sinking this shaft through the drift a cast-iron segmental shaft frame was used.

In May, 1867, the washdirt was reached from the No. 2 shaft workings, and shortly afterwards a connexion was made with the Kohinoor workings under Pleasant-street. By the end of June, No. 1 shaft workings had been connected by bores to the wash, a small bucketful of which yielded 2 dwt. 18 gr. At this time 400 men were employed by the company. The wash was found to be very extensive, with no defined gutter in the claim, and was taken out for a width of from 500 feet to 800 feet. It was from 2 ft. to 8 ft. thick. By the end of 1867, the weekly output of the mine averaged over 500 oz. For the fortnight ending 22nd October the yield was 1,486 oz. Good payable yields were kept up during 1868, but towards the end of that year they fell away, and early in 1869 the mine was worked out after having obtained the following yields:—

| | oz. | dwt. | gr. |
|---|---|---|---|
| 1867 ... | 17,585 | 5 | 0 |
| 1868 ... | 15,447 | 0 | 0 |
| Total ... | 33,032 | 5 | 0 |

£38,250 was paid in dividends on a called-up capital of £17,962 10s.

BAND OF HOPE COMPANY.

Portion of the area held by this company was first registered in 1856, when a number of claims (each eight men's ground) were taken up. Owing to the great expenses which had to be met before profitable results could be expected, the claimholders, before commencing operations, formed a number of companies to work five claims each. Three of these companies later amalgamated, and formed the Band of Hope Company with 120 men's ground. In March, 1857, boring began. The first bore was lost at a depth of 165 feet, and a second bore sunk at 6 feet distant alighted on the top of the lost drill, and occupied nearly three months in cutting out. At 210 feet the bore was abandoned. During twelve months while boring was in progress the majority of the shareholders forfeited their interests, leaving only twenty-six out of the original 120 holders. Companies holding adjacent areas where bores failed to locate the deep lead also suffered, and large areas were abandoned. The result was that the areas held by the Western, the Perseverance, the Red Lion, the Victoria and the Pioneer companies were all taken over by the Band of Hope Company. The Perseverance Company, registered for the Redan lead, had bored to a depth of 294 feet without bottoming. This deep ground was supposed to overlie the main Golden Point lead, and the Band of Hope Company therefore sank its No. 1 shaft within 250 feet of the Perseverance Company's bore in March, 1858. Owing to the isolated position of the shaft, great difficulties in connexion

with the water in the basalt had to be overcome while sinking. In October, 1858, the company re-organized under Ireland's Act, with a nominal capital of £16,800 in £20 shares. In 1859, a change in the mining by-laws permitted of the holding of larger areas under the frontage system, and the claim was therefore re-registered for forty-four men's ground, which comprised a larger area than was formerly held by 120 men. In June, 1860, the then existing company was wound up, and was re-organized under Haine's Act as a limited liability company with a capital of £25,000 in £10 shares, entitled the New Band of Hope Company.

The following additional frontage claims were registered on 29th June, 1861:—Golden Point lead, 60 men, total, 8,840 feet, adjoining the Kohinoor Company; Frenchman's lead, 60 men, total 5,100 feet, adjoining the Albion Company; Redan lead, 60 men, adjoining the Great Extended Company; Inkerman lead, 60 men, adjoining the Hand in Hand Company; Suburban lead, 60 men, from the southern boundary of Sturt-street. The resultant areas from the above registrations, owing to the junction of several of the leads, was somewhat complex, and this example serves to show the difficulties that would have arisen had the several registrations been effected by different parties (see Fig. 19).

Sinking No. 1 shaft proved costly; before it passed through the first rock a set of 12-in. pumps had to be installed, and after the first rock had been pierced and the shaft had been puddled the pressure of water became so great that the timbers broke repeatedly. In the second rock, an additional flow of water was encountered which necessitated larger pumps, and the shaft had therefore to be enlarged. A 15-in. pump just sufficed to keep the water in check while shaft-sinking was in progress. By November, 1860, £17,000 had been expended of which £2,500 was for boring, the remainder being the cost of sinking the shaft to a depth of 230 feet, and of installing machinery. Below 230 feet the shaft was sunk by contract, the price being £16 per foot. Repairs to the shaft and "puddling back" cost £1,900 in 4 months. In October, 1862, the shaft was bottomed at 280 feet, and was continued to 340 feet; at this depth a cross-cut broke through into a body of drift at 180 feet from the shaft with the result that the mine was swamped and the shaft was flooded for 100 feet. The pumping machinery proved inadequate and additional machinery was installed; this lowered the water sufficiently to allow the construction of an upper level, from which a winze was sunk to the swamped level. Large quantities of clay and stones were then thrown into the flooded level to form a wall in order to prevent the sand reaching the pumps. Eventually the flooding was overcome, but at the cost of over two years' hard work. The shaft was sunk another 60 feet, making the total depth 400 feet, in April, 1866, more than eight years after it had been begun. From a drive east at the 400-ft. level a rise was put up at 170 feet from the shaft; at 60 feet above the level deep ground was met with, but it carried a large body of water, and the mine was again swamped.

Shortly afterwards the shaft with the surrounding area was transferred to the United Hand in Hand and Band of Hope Company (Hand and Band). The cost of sinking this shaft, &c., to 29th September, 1866, was £29,565 8s. 11d., of which £17,476 10s. 6d. was spent in sinking; the plant cost £4,781; shaft-sinking cost over £70 per foot.

In August, 1863, the company re-organized under Pyke's Act with a capital of £64,000, in 3,200 shares of £20 each, with power to increase to £80,000 by the issue of new shares.

In December, 1861, the Golden Gate Company, having ceased operations, disposed of its claim and shaft to the Band of Hope Company for £800. The shaft, originally only 5 feet by 3 feet, was cut down to 8 feet by 3 feet, in 1863, to form the No. 2 shaft of the Band of Hope Company; it was deepened to 420 feet, and a level was opened to command the Redan lead, below the Great Redan Extended claim, or, as subsequently proved, the Golden Point lead below the junction. A main drive was opened out S. 57° W. and at 810 feet a blind shaft intersected the gutter 50 feet above the back of the drive. The gutter at this point was over 200 ft. wide with washdirt 5 ft. 6 in. thick. Double deck cages were used by the end of 1864, and the number of trucks raised per shift averaged 400. The first gold was obtained from No. 2 shaft in June, 1864, and the first dividend was paid in July of the same year.

In 1864, during the hearing of the lawsuit between the Kohinoor, the Great Extended and the Band of Hope companies as to an area between the claims, the Great Redan Extended (Great Extended) Company decided on making an offer of £23,000 to the Band of Hope Company for its share in the disputed area. This offer was accepted, and the Band of Hope Company was therefore no longer a party to the suit with the Kohinoor Company. As the junctioning of the Redan and Golden Point leads would affect both the Great Extended and the Band of Hope Companies below the point of confluence, it was agreed that each of these companies should have an equal joint interest in all ground for which the Band of Hope Company had registered, and which was not included in the strip of disputed territory. As the shareholders in the Great Extended Company bought up Band of Hope shares at a low figure during the course of litigation, the above scheme was the more easily carried out. The total amount (which included half the law expenses) paid by the Great Extended Company to the Band of Hope Company was £34,648. The Band of Hope Company then altered its title to the United Extended Band of Hope.

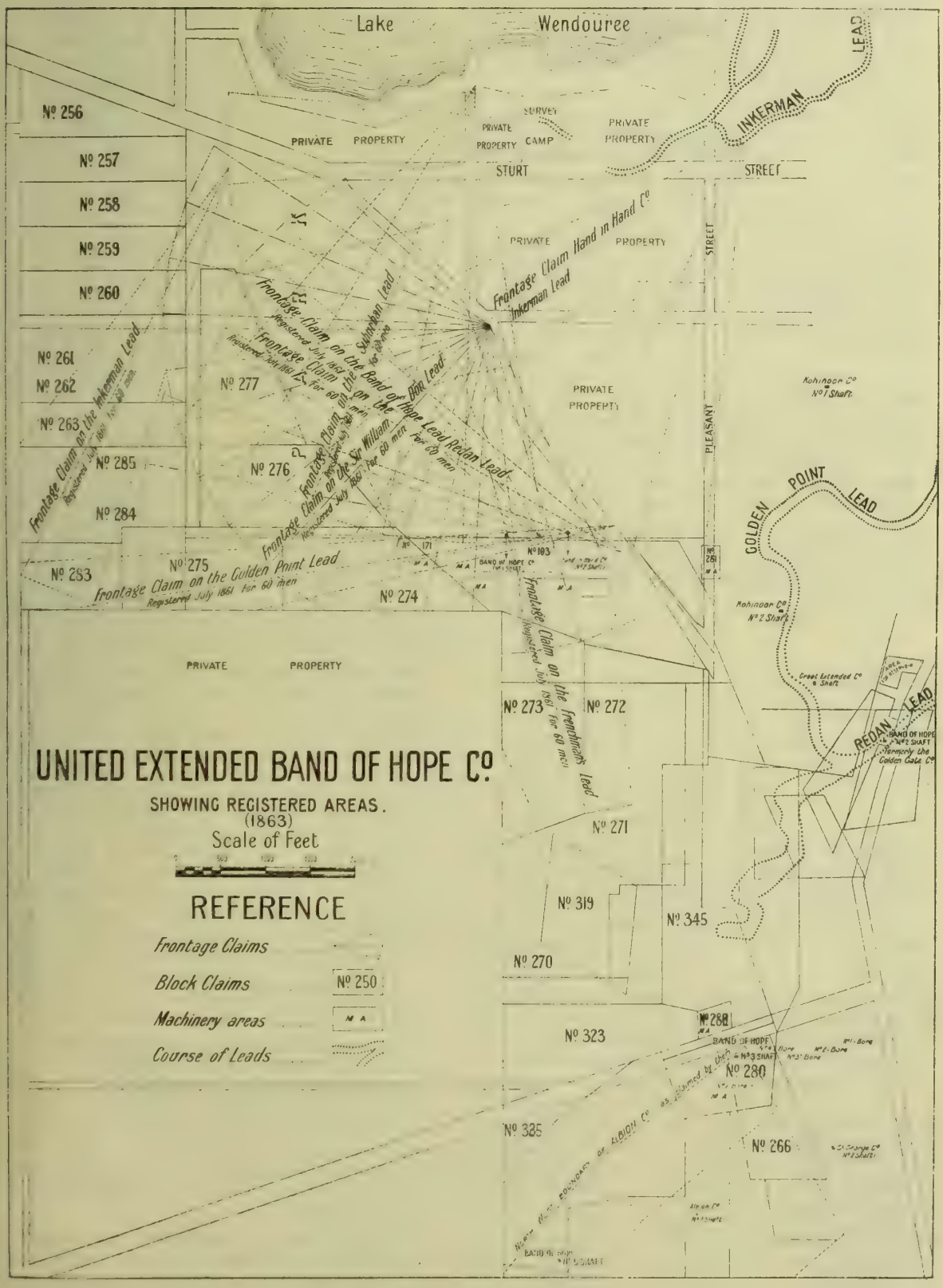
Operations at No. 2 shaft were conducted on an extensive scale throughout 1865. For the first half-year the value of the yield was £100,135, representing nearly a ton of gold, and the expenditure was £40,954; this outlay included nearly £6,500 expended at No. 1 shaft and provision for machinery and additions. The actual cost of raising and cleaning the gold was £26,900, which would leave a margin of profit of £73,234 for the half-year had it not been for the extra expenses already mentioned. At this time the formation of a reserve fund for shaft-sinking, &c., was initiated by the directors. The price received for the gold by the company in 1865 was from £4 2s. 6d. to £4 3s. 1d. per oz.

Boring for a site for a No. 3 shaft was begun, and six bores were put down before a site was selected. Air pipes were placed in the main level, and a machine was erected to ventilate the workings. This was the first instance in which metal air pipes were used on the field. In the same year gas-pipes connected with the town mains were installed in the main drive and successfully used for lighting the level. The reef-washes on both sides were worked in conjunction with the washdirt in the gutter. In all, six blind shafts were

used during 1865. The quantity of washdirt hauled varied from 400 to 520 trucks per shift of eight hours throughout the year. No. 3 shaft was begun on 25th November on the south side of the Smythesdale road; the contract price for the sinking was £13 10s. per foot to a depth of 400 feet, the contractor finding labour and appliances to haul the dirt. A pumping and a winding engine were erected at the beginning of this work. Boring operations were continued but the progress in the deeper bores was slow, averaging under 6 inches per day when deeper than 300 feet.

In 1866, operations at No. 2 shaft were confined to the vicinity of Nos. 5, 6, 7, and 8 monkey shafts. The gold yield for the half-year ending in August was 25,415 oz., valued at £101,855, from 261,000 trucks of washdirt; the total output of the mine during two years and two months was valued at £361,402; £65,000 was paid in dividends for the first half of the year 1866, making the total £212,800. At No. 2 shaft the gutter was being worked about 250 feet in width.

In September, 1866, the mine was flooded, the water rising 13 feet above the level of the




F.G. 19.

drive. This flooding caused a fall of £96,000 in the market value of the shares within 24 hours, but within a month work was resumed below.

The yearly consumption of firewood at No. 2 shaft alone was 9,000 tons (50 feet to the ton) costing from 7s. to 8s. per ton, and, in consequence, a trial was made in 1866 of Newcastle coal which cost £2 8s. 4d. per ton delivered on the mine.

No. 3 shaft, at a depth of 170 feet, met with 800 gallons of water per hour, and sinking was retarded. By the end of the year the shaft was 230 feet deep. No. 4 shaft, measuring 10ft. 6in. by 6ft. 6in. was begun in the centre of the Miner's Racecourse in September, 1866, and by the end of the year it had been sunk 85 feet at a cost of £8 4s. 3d. per foot.

In 1867, work at No. 2 shaft was continued from No. 9 monkey-shaft, about a dozen drives going through wash. The yield for the first half-year was 17,000 oz. and the gutter maintained its width and values. On 25th July, 1867, the day's yield from No. 2 shaft was 1,054 oz. 15 dwt., and on 1st August, 1867, 1,637 oz., the highest yet recorded; for the week ending 3rd August, 1867, the yield was 3,734 oz., the previous week's yield being 2,364 oz. Work in this rich run was continued throughout 1867, a few of the weekly yields being:—

| Period. | Gold Yield. oz. | dwt. | gr. |
|---|---|---|---|
| Week ending 9th November, 1867 .. | 1,211 | 7 | 0 |
| Five days ending 15th November, 1867 | 1,947 | 2 | 0 |
| Week ending 23rd November, 1867 .. | 1,362 | 0 | 0 |
| Week ending 7th December, 1867 .. | 1,569 | 8 | 0 |
| Week ending 14th December, 1867 .. | 1,068 | 14 | 0 |
| Three days ending 21st December, 1867 | 729 | 5 | 0 |
| Week ending 28th December, 1867 .. | 1,053 | 0 | 0 |

By the end of 1867, No. 3 shaft had reached a depth of 420 feet and drives were opened out east and west. The strata passed through in this shaft were:—

| Formation | Thickness. feet. |
|---|---|
| Soil and clay .. .. .. .. | 8 |
| Basalt (first rock) .. .. .. .. | 82 |
| Clay .. .. .. .. .. | 9 |
| Basalt (second rock) .. .. .. | 103 |
| Clay .. .. .. .. .. | 25 |
| Basalt (third rock) .. .. .. .. | 60 |
| Clay .. .. .. .. .. | 28 |
| Basalt (fourth rock) .. .. .. | 84 |
| Bottomed at 399 feet | |

The cost of sinking No. 3 shaft was £11,858; the chief items were wages and explosives £6,792, timber £2,592, stores £812, and fuel £1,662.

No. 4 shaft reached a depth of 242 feet in July, 1867, having entered the third rock at 232 feet.

In 1868, sinking No. 4 shaft was continued. No. 5 shaft was begun in January, 1868. Washdirt was being raised from No. 3 shaft. Operations at No. 2 shaft continued with rich results at times. Some of the weekly yields were:—

| Week ending:— | Gold Yield oz. | dwt. | gr. |
|---|---|---|---|
| 4th January, 1868 .. .. .. | 2,345 | 1 | 0 |
| 11th January, 1868 .. .. | 2,388 | 10 | 0 |
| 18th January, 1868 .. .. | 2,500 | 0 | 0 |
| 25th January, 1868 .. .. | 1,748 | 0 | 0 |
| 1st February, 1868 .. .. | 2,720 | 0 | 0 |
| 8th February, 1868 .. .. | 3,744 | 4 | 0 |
| 15th February, 1868 .. .. | 2,781 | 0 | 0 |
| 22nd February, 1868 .. .. | 2,051 | 0 | 0 |
| 29th February, 1868 .. .. | 1,278 | 8 | 0 |
| 7th March, 1868 .. .. .. | 4,668 | 15 | 0 |
| 14th March 1868 .. .. .. | 1,655 | 0 | 0 |
| 21st March, 1868 .. .. .. | 1,917 | 0 | 0 |
| 28th March, 1868 .. .. . | 894 | 5 | 0 |

The yield for 7th March, 1868, was no less than 2,832 ozs., worth over £11,500.

In March, 1868, it was decided to amalgamate with the Albion Company under the title of the Band of Hope and Albion Consols Company.

From June, 1864, when gold was first found, to the end of January, 1868, the total output from the Golden Gate or No. 2 shaft was valued at £652,536, and the dividends amounted to £382,400.

### BAND OF HOPE AND ALBION CONSOLS COMPANY.*

This company was formed in 1868 by the amalgamation of the United Extended Band of Hope (Band of Hope) Company and the Albion Company. The Band of Hope (the parent company) was registered in 1856, when boring operations were commenced on the Golden Point lead. In 1861 the Golden Gate shaft on the Redan lead was purchased and became the company's No. 2 shaft. The work of enlarging this shaft began in December, 1861, and the shaft was sunk to a depth of 420 feet in September, 1863. The first gold was found in May, 1864, after an expenditure of £31,600. By agreement, some ground was acquired from the Great Extended Company and the company altered its title to the United Extended Band of Hope Company. It was then registered under the frontage system for the following leads:—Golden Point, 8,840 feet; Inkerman, 5,100 feet; Redan, 5,100 feet; Frenchman's, 5,100 feet; Suburban, 5,100 feet; Dead Horse, 8,800 feet.

In March, 1868, after a lengthy period of litigation with the Albion Company (see p. 76), it was agreed to amalgamate the two companies under the style of the Band of Hope and Albion Consols, with a capital of £449,000 in 22,450 shares paid up to £20, 16,000 shares going to the shareholders of the United Extended Band of Hope and 6,450 shares to the Albion shareholders. Up to the date of amalgamation the Albion Company had won 84,324 oz. of gold, and the United Extended Band of Hope Company 188,490 oz.

The amalgamated company at its inception possessed five shafts with various workings as under:—No. 1 shaft, the original No. 1 shaft of the Albion Company; No. 2 shaft, originally the Golden Gate shaft or No. 2 shaft of the Band of Hope Company; Nos. 3, 4, and 5 shafts were the Nos. 3, 4, and 5 shafts of the United Extended Band of Hope Company. The workings from these shafts at the date of amalgamation were at No 1, a main drive west 1,600 feet, a drive south 2,500 feet, a drive east 3,000 feet, a drive north 2,500, and a north-westerly drive 3,000 feet. The gutter was being worked in several places. In the western and north-western workings, extensive deposits of washdirt were exposed. From the western drive an extensive reef-wash, over 500 ft. in width, was proved at a depth of 374 feet below the surface.

At No. 2 shaft (originally the Golden Gate), the main Golden Point gutter and the adjacent reef-washes were yielding handsome returns; the main working faces were distant 2,000 feet from the shaft. The gutter was narrow (200 feet and upwards) with from 2 feet to 6 feet of washdirt covered by sandy headings, in marked contrast to the Albion workings where the basalt formed the cover of the wash.

At No. 3 shaft, the washdirt was tapped in several places north, east, and west of the shaft, and cross-drives, preparatory to blocking, were being put in.

* For plan see Prog. Rept., Geol. Surv. Vict., No. VI. p. 51.

Nos. 4 and 5 shafts were being sunk, No. 4 being 330 feet deep, and No. 5, 50 feet.

A few months previous to amalgamation with the Albion Company, the Band of Hope had excavated and washed 2,500,000 cubic yards of auriferous alluvial and decomposed bed-rock, and recovered 161,943 oz. of gold valued at £656,869, and yielding in dividends £388,000.

As the workings at Nos. 1 and 2 shafts were on good gold, the first month's washing of the newly formed company resulted in a clean up of 6,421 oz. out of which a dividend absorbing £11,225 was paid for the month. The yield for the following month amounted to 10,383 oz. of gold, and the dividends to £22,500. By the end of the year over 50,000 oz. of gold had been won and £81,380 10s. paid in dividends. Soon after amalgamation the company bought the claim of the Great Redan Extended Company in which a quartz reef had been proved to exist.

During the latter part of 1868 little washdirt was taken from the gutter at No. 2 shaft, an agreement being made with the St. George Company enabling the reef-wash on both sides of the gutter to be worked. An extensive bed of highly auriferous cement was located from the No. 2 shaft. At No. 3 shaft the gutter was proved to be very wide but of uneven value. Washdirt was reached in two places from No. 5. shaft. The gold yields for the half-year ending January, 1869, were: No. 1 shaft 9,265 oz., No. 2 shaft 14,253 oz., No. 3 shaft 4,050 oz., total 27,568 oz. of crude gold.

During 1869 operations continued at Nos. 1, 2, 3 and 5 shafts; monthly yields ranged from 3,000 oz. to 5,485 oz. (February), and dividends, though smaller than those of the previous year, were regularly paid. At No. 1 shaft operations in the south-eastern portion of the mine revealed extensive wash carrying a little gold and a balance-shaft was put up to explore it. At No. 2 shaft the reef-washes still yielded well. At No. 3 shaft the construction of reef-drives and monkey shafts occupied a considerable time; a run of wash trending south-westerly was unproved. The yields for the last half of the year were:—No. 1 shaft, 7,567 oz.; No. 2 shaft, 11,509 oz.; No. 3 shaft, 4,034 oz.; No. 5 shaft, 106 oz. The results from No. 5 shaft did not come up to expectations.

In 1870, at No. 1 shaft, payable washdirt was worked in the southern and eastern parts of the mines; the eastern reef-wash was proved upwards of 300 feet in width, several machines averaging 5 oz. 6 dwt. each; and an extensive deposit of reef-wash on the western side yielded 4 oz. 5 dwt. to the machine. Portions of the workings from this shaft were let on tribute. The gold yield from No. 1 shaft for the first six months of the year was, 5,967 oz.

At No. 2 shaft a large field of reef-wash was opened on the western side of the lead at 200 feet above the main gutter. A trial crushing of 340 tons from a quartz reef 18 in. to 4 ft. wide yielded 5¼ dwt. to the ton; the quartz came from 100 feet below the alluvial. This shaft was largely worked on tribute before the end of the year

At No. 3 shaft the gutter was traced westward with poor results and this part of the mine was let on tribute.

At No. 5 shaft the gutter was worked southerly with unpayable results, and the workings from this shaft were also let on tribute. For the six months ending July, 1870, the yield was 330 oz. In the following December the tributers struck a run of ground deeper than that formerly worked and a decided improvement took place in their yields.

In 1871 the yields improved. At No. 1 shaft, the tributers constructed a drive to meet the gutter proved at No. 5 shaft, and payable ground was met with and worked during the year. At No. 2 shaft, litigation with the St. George Company delayed for a time operations in the southern portion of the mine, but soon after the settlement some rich ground was located by the tributers, who worked out the patch and abandoned their tribute. At No. 3 shaft the yields for the first six months were very poor, but they improved towards the end of the year. At. No. 4 shaft washing began in March; an immense area of reef-wash was proved and worked from this shaft during the year. At No. 5 shaft operations were confined to the country south and east, the tributers obtaining fair returns. The gold won from all shafts for the year amounted to over 40,000 oz. as against about 26,000 oz. for the previous year.

During 1872, mining at the Sebastopol Plateau began to decline rapidly, but the Band and Albion Consols maintained a premier position and paid regular dividends, in marked contrast with adjacent companies which were closing down or making calls. At No. 1 shaft the tributers worked the tributary lead north of No. 5 shaft. At No. 2 shaft the reef-washes were further worked. At No. 3 shaft the results were unsatisfactory, and almost the whole of this part of the mine was worked by tributers. At No. 4 shaft, which yielded the bulk of the washdirt, blocking was carried out along the northern and western boundaries, where connexions were made to the Hand and Band and the Saints companies workings to insure good ventilation. No. 4 shaft was sunk to a depth of 465 feet during the year to test the quartz lode at a depth. At No. 5 shaft the tributers met with payable ground over a large area. The total gold yield for the year amounted to 42,867 oz.

In 1873, a considerable extent of low-grade wash was opened up from No. 1 shaft and partly prospected throughout the year by tributers. At No. 2 shaft, reef-washes on both sides of the gutter were prospected but did not prove payable. At No. 3 shaft, the tributers abandoned the workings, and blocks were let to fossicking parties. No. 4 shaft was sunk to 542 feet during the year, and a level was opened out at 500 feet on the quartz lode along which drives were put in 180 feet north and 180 feet south, but the quartz proved poor. At No. 5 shaft the tributers threw up their lease in May and shortly afterwards this shaft was closed down. Only 8,712 oz. of gold was won during the year.

During 1874, the yields fell off still further. In the first half-year only 1,576 oz. of gold was won. At No. 1 shaft the yield was very small. The fossicking parties at No. 2 shaft returned a steady revenue to the company by working small blocks and pillars left when the richer parts had been blocked out. Work at No. 3 shaft was confined to pumping, and even this ceased altogether before the end of the year. No. 4 shaft was sunk to a depth of 610 feet, intersecting the lode at 600 feet from the surface; the lode here was unprofitable. At the 500-ft. level, drives were carried over 600 feet along the course of the lode without proving any payable stone. Two crushings, one at the 300-ft. level and one at the 500-ft. level were taken out by the tributers, but were

unpayable. By the close of the year the shaft was being used to work the old ground about the Great Extended Company's workings.

In 1875, mining operations were very limited. The prospecting operations from No. 1 shaft opened up a large field of unremunerative wash; the workings from this shaft were flooded in November. Operations at No. 2 shaft ceased early in the year. At No. 3 shaft a new level was opened out as the deeper levels would soon become unworkable owing to the flooding of the adjacent mines. In December the water reached this shaft and although the pumps at No. 1 shaft were kept going at full speed the water rose 3 inches a day. At No. 4 shaft fossicking in old ground continued, but it was not profitable.

During 1876 the water accumulated to such an extent that operations at Nos. 1 and 3 shafts ceased. Nos. 2 and 4 shafts were let on tribute. A new shaft (No. 6) was sunk near the Yarrowee Creek to test the Burra Burra line of reef; a drive was put in easterly for this purpose and another westerly to test the Redan gutter.

In 1877, a bed of wash west of No. 2 shaft opened up well and yielded 2,887 oz. of gold during the year before the deposit was exhausted. Meanwhile a similar deposit of heavy wash on the eastern side of the gutter was being opened up. In November, 1877, the tributers at No. 4 shaft struck a patch of wash which yielded 73 oz. 9 dwt. of gold from 5 machines. At No. 6 shaft a small but well defined lode was struck, and a crushing yielded 10 dwt. of gold per ton. The shaft was sunk to a depth of 250 feet by the end of the year.

In 1878, the wash opened up from No. 2 shaft on the eastern reef proved unpayable. At No. 4 shaft the wash opened up well and yielded over 2,500 oz. of gold during the year. At No. 6 shaft operations were confined chiefly to exploring the old alluvial workings on the Miner's Right lead, which was found to be a narrow gutter with precipitous sides; 18 machines of washdirt yielded 158 oz. 7 dwt. of coarse gold. The quartz reef was broken by a cross-course where intersected by the lower level, but prospecting along it was carried on.

During 1879 payable wash was located at No. 2 shaft by the tributers, who won 386 oz. of gold during the first half-year. At No. 4 shaft, the tributers obtained 1,551 oz. of gold. From the Miner's Right lead 114 oz. of gold was won. In February a trial crushing of 19 tons of quartz leaders from the 268-ft. level yielded 8 dwt. per ton, and marked the advent of a new era in the company's history. The quartz leaders were followed up, and resulted in the opening up of a lode which carried payable stone 40 ft. in width. A crushing of 2,660 tons yielded 3,877 oz. of gold. By July, 1879, the lode was opened up for 600 feet, and two new shafts (Nos. 7 and 8) were started to prove its northern extension. At No. 2 shaft the alluvial was exhausted, and the tributers ceased working in December, 1879. At No. 4 shaft the tributers ceased on the same date, and the plant was removed to No. 7 shaft. The quartz reef in Nos. 6 and 7 shafts began to yield well. No. 7 shaft reached a depth of 360 feet by the end of the year. At the 360-ft. level the lode was over 40 ft. wide and carried gold throughout. A battery of 40 heads was erected and this, together with the 20 heads at No. 6 shaft, made a plant capable of treating 800 tons per week. No. 8 shaft was sunk to 320 feet when legal trouble arose with an adjoining mine.

The mine now became a quartz mine, and its subsequent history is given on page 121.

### BRITISH COMPANY, MALAKOFF LEAD.

Shaft-sinking began in September, 1856, on a site south of South street, between Raglan and Skipton streets. The shaft was bottomed at 270 feet, and was continued in bed-rock to 304 feet. After a drive had been opened out operations were confined for a considerable time to a run of wash above the level of the main gutter, and only small dividends were paid while this work was in progress. In March, 1858, the gutter was struck, and proved to be about 150 ft. wide, and the reef-wash was almost the same width. By October, 1858, the dividends paid since locating the lead amounted to between £12 and £13 per 48th share, and dividends averaging £4 to £6 per week were also paid from the gold won from the reef-wash which was situated at the upper edge of a black clay and a little above the level of the gutter. Dividends amounting to £49,768 were paid from a total output valued at £50,505. Rather more than half the gold was obtained from the reef-wash.

### BRITISH WORKMAN COMPANY.

This was a short-lived company which owed its formation to the developments on the Mill lead (see p. 96). The site of the claim was Brown's paddock, near Wendouree parade. The company was formed in 1861, and the shares provided a lively market stock, rising in price from £5 to £60 per share in a week. The company was unsuccessful in its efforts to locate the lead and operations ceased in 1862.

### BALLARAT MILL COMPANY.

This company, formed to work the Mill run, a short lead, in 1861 sank a shaft on Hassell and Monckton's freehold, near Wendouree-parade. The strata passed through consisted of:—

| Formation. | Thickness. feet. |
|---|---|
| Soil .. .. .. .. | 8 |
| Basalt .. .. .. .. | 132 |
| Clay and gravels .. .. .. | 31 |
| Bottomed at .. .. | 171 |

At a depth of 220 feet, the main level was opened out, but the gutter was located within 15 feet of the shaft at a depth of 171 feet. A drive from the main level to the boundary of the claim located the lead at a point where the washdirt was rich, a bucket of dirt yielding a prospect of 4 oz. 9 dwt. The washdirt averaged 10 ft. thick, and was 50 ft. to 150 ft. wide. At a depth of 190 feet, a level was opened out to work the lead upstream, and the lead was followed for 300 feet. The first gold was obtained about the end of 1861, and the first fortnightly dividend paid was £12 per share. The dividends increased until, in May, 1862, they rose to £56 for the fortnight. After a rapid rise in value, shares being firmly held at £500 each, a sudden fall took place, and by the end of October, the mine was worked out and abandoned. This led to the closing down of the adjacent mines on the lead, viz., the British Workman, the Clifton, and the Wheatsheaf companies.

Before the mine closed down, the red wash of the Mill lead gave place to a white wash in which several prospecting drives failed to disclose anything payable.

The yield from the mine from January to October, 1862, was 2,925 oz. of gold, valued at £11,590. The total dividends amounted to £8,372, or £322 per share, and the total expenditure was £5,614.

BURRA BURRA COMPANY, MILKMAID LEAD.

This company of forty-eight shareholders began shaft sinking on the eastern side of Errard-street, south of Sebastopol-street, early in 1857. The strata passed through consisted of:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (top rock) .. .. .. | 64 |
| Brittle clay .. .. .. .. | 10 |
| Basalt (second rock) .. .. .. | 70 |
| Tough yellow clay .. .. .. | 40 |

The shaft bottomed at 184 feet on a large quartz reef, and was sunk to a depth of 300 feet. A level was opened eastwards at 290 feet from the surface, and at 60 feet from the shaft a quartz reef was struck which caused much trouble. A rise put up at 240 feet from the shaft located the gutter of the Milkmaid lead at 30 feet above the level. Ten months were occupied in shaft-sinking and four months in driving the level and reaching the gutter. In August, 1858, 25 loads of wash yielded 110 oz. of gold. The width of the lead increased from 20 feet in the eastern portion of the claim to 60 feet at the western end. The wash averaged 7 ft. thick, and yielded on the average over 30 oz. of gold to the machine. The best yields were obtained where the bottom consisted of slate. The total return from 2,250 feet of gutter was 18,500 oz. of gold, and the total dividends £49,300. The cost of sinking the shaft and driving to the gutter, exclusive of labour, and including the cost of the engine, was £3,200. In 1860, the alluvial was completely worked out, and the company turned its attention to the quartz reef, in which 100 feet of the shaft had been sunk. A battery, the largest plant in Ballarat, was erected. Trial crushings from the quartz lode in 1858 yielded 3 oz. 9 dwt. of gold from 10 tons at Tredennick's battery. In 1860, 40 tons treated at the Township Company's battery gave between 3 dwt. and 4 dwt. per ton, while a parcel of 11 tons at Tredennick's battery yielded 21 oz. 10 dwt. The company's new battery began crushing in April, 1861, and proved, after twelve months' work, that the reef, although large, was unpayable.

The ground was subsequently worked by the New Burra Burra Quartz and Alluvial Company in 1863, and later by the Burra Burra Company in 1868.

CAMP COMPANY.

The Camp Company, Cobbler's Lead, had some rich yields between May and December, 1861, and divided £16 to £70 per share weekly during that period. The ground was later the property of the Sebastopol Company.

COSMOPOLITAN COMPANY.

This company of forty shareholders, holding five claims of eight men's ground, began shaft-sinking in February, 1857, near the north-west corner of Eyre and Windermere streets. The shaft bottomed at 110 feet after passing through 6 feet of clay and 104 feet of basalt. A second shaft 900 feet south of the first was begun in August, 1857, in Windermere-street, between Urquhart and Eyre streets. This shaft was 7½ ft. by 3½ ft. in the clear, and was divided into three compartments, one for pumps, one for hauling, and one for ventilation. By January, 1858, the shaft had reached a depth of 120 feet. It bottomed at 165 feet, passing through:—

| Formation. | Thickness. feet. |
|---|---|
| Surface soil .. .. .. .. | 2 |
| Basalt (first rock) .. .. .. | 112 |
| Clay .. .. .. .. | 16 |
| Blasalt (second rock) .. .. .. | 27 |
| Clay .. .. .. .. | 6 |
| Total .. .. .. | 163 |

The shaft was sunk 200 feet in the bed-rock, and at 365 feet from the surface a drive was put in 1,300 feet southerly in hard country before breaking through into deep ground. At this point an incline drive followed down the surface of the bed-rock for a distance of 130 feet, on a slope of 24 feet in the 100 feet. From the foot of the incline the drive was horizontal for 100 feet, and then dipped 13 feet in the next 60 feet. At this point the gutter was first met with in August, 1859, but, owing to law suits, &c., little progress was made until March, 1860. The cost of works prior to striking the gutter was £3,486, exclusive of the labour of 40 claim-holders for two years. The estimated expenditure of the furnisher[1] was £2,500. The drives in washdirt required heavy timber, and close sets were used. Owing to the system of incline drives the water in the gutter became difficult to cope with, and consequently the main level was extended, and a blind shaft was sunk below the gutter level, where a pump was installed to force the water up to the main level.

In 1861, very rich ground was discovered. The highest return for one week was 1,461 oz. (dividend, £134 per share), in July, 1861. A portion of the gutter 220 feet wide by 250 feet long yielded £100,000 worth of gold out of which £80,000 was paid in dividends by August, 1862.

Bad air in the workings tended to affect the output materially, and a system of ventilating drives was decided upon. Two parallel drives, with openings at intervals, were utilized, as well as a furnace at the shaft to increase the air current. The mine was swamped several times, and caused great inconvenience owing to the methods of working.

Many nuggets were found, both in the gutter and high on the reef.

In September, 1863, a supposed branch lead was discovered, and claimed as a frontage lead under the title of the Cosmopolitan lead. The washdirt was yellow, while that of the Golden Point lead was black, but the supposed tributary proved to be a terrace or reefwash deposit. It gave rich returns.

In September, 1864, the co-operative company was wound up, and the company was registered under the Limited Liability Act.

In October, 1865, the company purchased the claim and shaft of the Burra Burra Company, and erected machinery thereon, and, in 1866, repaired the shaft, and opened out for the gutter, which had been proved within 500 feet of the shaft. In July, 1866, the former main shaft and portion of the original claim were sold to a new company called the New Cosmopolitan, which had a capital of £10,128 in 2,532 shares of £4 each issued at 10s. per share, and the Cosmopolitan Company confined its operation to the Burra

[1] The term used for the capitalist who held a sleeping interest, and provided the machinery, &c.

Burra shaft. In October, payable wash was struck, one machine yielding 62 oz. 9 dwt. of gold, including a nugget of 15 oz. 14 dwt. The amount of payable ground was small, although a wide lead was proved, the workings lay below the level of the drive, and the company was not in a position to drive a lower level for 700 feet. Attention was therefore paid to a quartz reef, but it was unpayable, yields being only 2½ dwt. per ton. The company closed down at the end of 1867.

*Gold Yields.*

| Period | Gold Yield. | | |
|---|---|---|---|
| | oz. | dwt. | gr. |
| 1857 to 1862 .. .. .. | 18,427 | 16 | 6 |
| 1862 .. .. .. | 7,136 | 1 | 3 |
| 1863 .. .. .. | 6,830 | 9 | 22 |
| 1864 .. .. .. | 6,515 | 17 | 0 |
| Total to December, 1864 .. | 38,910 | 4 | 7 |

Total dividends to the end of May, 1862, £67,851, 7s.

Total dividends to the end of December, 1862, £85,701 7s.

Total dividends to the end of December, 1863, £106,533 7s.

Calls received up to time of striking gold, £2,241 15s.

Calls received from the Kohinoor Company, £226.

Calls received from the Burra Burra Company, £2,750.

### CRICKET RESERVE COMPANY.

This company, formed on 23rd July, 1867, purchased the shaft and plant of the Privateer Company. The old Privateer shaft was sunk an additional 50 feet, and a main reef drive was carried for 400 feet into the Cricket Reserve (Western Oval, Pleasant-street). The Sir William Don quartz reef was struck in the workings, and a crushing was taken out, but the return was not recorded. A layer of cement 4 feet in thickness was worked with profitable results. An extensive field of wash 400 ft. wide, and from 3 ft. to 20 ft. thick was opened up. Washdirt was treated from November, 1867, till June, 1868, when the mine was worked out. The total yield was 13,582 oz., and the dividends £25,000. All this was won in less than half a year.

### CUMBERLAND, DURHAM, AND CORNISH COMPANY (ROUND TOWER COMPANY).

This company was registered in May, 1856, and, secured claims Nos. 62 to 70 on the Frenchman's Lead, 108 men's ground in all. Shaft-sinking began in May, 1856, but the water proved too heavy so arrangements were made to work the lead within the claim from the shaft of the United Miners Company. In this way the gutter was worked from October to December, 1858. More powerful machinery was erected at the abandoned shaft, and the water difficulty was overcome. The shaft bottomed at a depth of 290 feet, and was continued to 355 feet. At 345 feet from the surface a level was opened out north to the gutter at 250 feet from the shaft. In June, 1860, an injunction to restrain the Red Jacket (registered for the White Horse lead) from working the Frenchman's lead within this claim was granted by the Court of Mines, and an order was made whereby the disputed ground was to be worked by fifty-three men of the Cumberland, Durham and Cornish Company, and thirty-eight men of the Red Jacket Company at the weekly wage of £2 8s. per man per week, under the management of Mining Surveyor Pringle. The remainder of the gold, after paying all expenses, was to be divided equally between the two companies. Under this arrangement 8,143 oz. of gold was won; £10,575 was paid to each company, and £537 to the manager. As soon as the Frenchman's lead was worked out, a dissolution of the old company was decreed by the Court of Mines, and a new company, consisting of a number of the shareholders in the original company, who had taken up an adjoining block claim, purchased the plant and claim for £2,295. The new company was called the Defiance (see p. 83).

### CITY OF BALLARAT COMPANY.

This company, formerly the Durham Company (see p. 83), began operations on 17th October, 1871, by starting to sink a main shaft at a point further west than any of the alluvial shafts of Ballarat West, and it is a matter of regret that the efforts of so determined a company met with such little success or encouragement in their labour. The shaft, 10 ft. 6 in. by 6 ft. 3 in. in the clear, was sunk on contract to a depth of 314 feet by the end of February, 1873. The water was very light, and some delay was ocasioned by the erection of machinery. For the next three and a half years, however, great difficulty was experienced on account of the heavy flow of water in the vesicular basalt forming the fourth rock. On 2nd December, 1876, the shaft was bottomed at a depth of 409 feet on a sloping reef dipping 4½ feet in 10 feet to the south-west. The strata passed through by the shaft were:—

| Formation. | Thickness. | Depth. | Remarks. |
|---|---|---|---|
| | feet | feet | |
| Soil .. .. | 1 | 1 | |
| Red clay .. .. | 7 | 8 | |
| Basalt (first rock) .. | 218 | 226 | At 202 feet from the surface a little water was struck. |
| Sedimentary deposit | 4 | 230 | |
| Basalt (second rock) | 20 | 250 | |
| Mud .. .. | 3 | 253 | |
| Fine sand and gravel | 10 | 263 | |
| Green marly clay, volcanic nature | 12 | 275 | |
| Basalt | 20 | 295 | |
| Obsidian (third rock) | 1 | 296 | |
| Basalt | 34 | 330 | Wet. |
| Green sedimentary deposit with volcanic scoria | 8 | 338 | |
| Basalt (fourth rock) | 24 | 362 | Pumped for over two years with a maximum of 3,000 gallons per minute from this basalt. |
| Cemented drifts .. | 5 | 367 | |
| Basalt (fifth rock) .. | 30 | 397 | This fifth layer of basalt was not met with in any of the other alluvial shafts in the district. |
| Black clay .. | 2 | 399 | |
| Red clay and floating reef with ironstone nodules | 10 | 409 | |
| Bottomed at | 409 | | |

The shaft was sunk to a depth of 517 feet and a chamber 50 feet long by 12 feet wide and 8½ feet high was excavated. At a depth of 510½

feet from the surface a main drive was put in southerly, but it broke through into the alluvial. A blind shaft was sunk 35 feet, and from this a drive was put in under the gutter. Sinking the main shaft was resumed and a total depth of 567 feet was reached. At 561 feet below the surface a drive was put in early in 1878 and connected with the blind shaft already mentioned. In the blind shaft workings, at a depth of 520 feet from the surface, the wash was found to be of a free gravelly nature, with cement on the bottom resting on a sloping bank dipping south-westerly. Bores put in from the main drive to the gutter gave prospects of gold, but an inburst of water from the blind shaft level kept the company engaged in pumping and baling for over three months. In 1879 bores from the main south drive, which had been extended 475 feet from the shaft, proved the gutter to be 30 feet above the back of the drive and 230 feet in width, but the ground was too wet to be opened up. At 290 feet south of the shaft an easterly drive was put in and wash was proved by boring to be 34 feet above the back of this drive at a distance of 210 feet from the main drive. This drive was extended in the direction of the old workings on the Durham gutter, and was later connected with the old drives near which a small block of payable ground was met with, but the workings generally were carried on at a considerable loss, and in 1884 the company ceased operations. The yields from the mine were:—

| Year. | Gold Yield. oz. | dwt. |
|---|---|---|
| 1881 .. .. .. | 67 | 12 |
| 1882 .. .. .. | 1,033 | 13 |
| 1883 .. .. .. | 389 | 1 |

DEFIANCE COMPANY.

This company acquired the claims of the Cumberland, Durham and Cornish Company after the latter company had worked out the Frenchman's lead, and also a block claim secured by some of the shareholders in the same company; this block claim was 850 feet in length and between 1,200 feet and 1,400 feet in width. A second block claim to the east, about 1,800 feet in length, was purchased from the Sebastopol Company. The mine lay to the south-east of the Nelson and Wellington Company's ground. The former company sank the shaft, 5 feet by 3 feet, to a depth of 355 feet, and opened out north and worked the Frenchman's lead up to the boundary of the Nelson Company. The Defiance Company opened out a prospecting drive southerly for a distance of 400 feet and put up a rise of 16 feet into a layer of wash-dirt that was supposed to be the gutter; this wash-dirt, which yielded 6 oz. to the machine, was followed for 200 feet to a point where a layer of basalt was found dipping south. An incline drive for 50 feet on a 1 in 3 grade failed to reach the gutter, and the main drive was therefore extended; at 580 feet south of the shaft the basalt was again encountered and the gutter was located 60 feet further south and at a depth of 11 feet below the level. To enable this ground to be worked a blind shaft 7 ft. by 3 ft. was sunk to a depth of 50 feet at a point 550 feet from the main shaft. The blind shaft was divided into three compartments one for air (3 feet by 1 foot), one for winding (3 feet by 2 feet), and the third for raising water in an 80-gallon tank. A horse whim was used to work the cage and tank in this shaft. The gutter was reached from the blind shaft by a westerly drive of 200 feet; it was up to 80 ft. in width and carried 2 ft. of wash-dirt in the centre and from 8 ft. to 9 ft. on the sides.

The following are the yields of the Defiance Company:—

| Period. | Gold Yield. oz. | dwt. | gr. | Dividends. £ | s. | d. |
|---|---|---|---|---|---|---|
| To 31st December, 1861 | 745 | 0 | 0 | .. | | |
| For year 1862 .. | 2,856 | 0 | 0 | 10,727 | 8 | 3 |
| For year 1863 .. | 11,183 | 9 | 22 | 35,351 | 0 | 0 |
| January to October, 1864 | 4,922 | 18 | 8 | 18,020 | 0 | 0 |
| October, 1864, to August, 1865 .. .. | 2,361 | 7 | 18 | Not ascertainable. | | |
| August to December, 1865 | 3,479 | 18 | 0 | 530 | 0 | 0 |
| January to December, 1866 .. .. | 4,649 | 6 | 0 | 3,180 | 0 | 0 |
| | 30,198 | 0 | 0 | | | |

The total yield from this mine amounted to 31,222 ozs. Dividends ceased on 30th January, 1866, to which date £67,808 8s. 3d. was paid.

In September, 1864, the company reorganized with a capital of £63,600 in 2,120 shares of £30 each paid up to £25 instead of the original 53 shares. Prior to this date the total gold yield, less money paid, was divided. After this date dividends were paid on profits only.

DURHAM COMPANY.

This co-operative company of twelve shareholders occupied a position on the northern side of Lake Wendouree, between Forest and Dowling streets. The ground was acquired in July, 1858. In November of that year the company was reorganized, and again in September, 1860, after £11,000 had been spent in shaft-sinking and development. When reorganized in September, 1860, the share register was increased to 100 shares of £70 each, but later the capital was raised to £20,000 in 500 shares of £40 each.

By the end of December, 1862, the company had three shafts: one near the head of the Swamp lead was purchased from the Black Diamond Company; the second, about 500 feet west of the first, was sunk to a depth of 175 feet; and the third or main shaft, 900 feet west of the last, was 280 feet deep. A level from the main shaft was opened out at 270 feet. The strata passed through in the shaft consisted of:

| | Feet. |
|---|---|
| Basalt (first rock) .. .. | 152 |
| Sand and drift .. .. .. | 3 |
| Clay .. .. .. .. | 5 |
| Bottomed at .. .. | 160 |

The second shaft passed through 150 feet of basalt into a drift which prevented further sinking. The contract price for the sinking of the main shaft (8 ft. 4 in. by 3 ft. 6 in.) was £14 per foot, the company providing material and machinery.

The main drive at the 270-ft. level was continued in an easterly direction for 720 feet where the gutter was struck and found to be trending south-west; a new level was therefore opened out south from the shaft and the gutter was located at 600 feet and followed downstream for 420 feet before losing level, after which the main shaft was deepened and a lower reef-drive was put in at a depth of 425 feet. The gutter where worked was only 20 ft. to 25 ft. wide, and the fall was 23 feet in 400 feet. In May, 1867, a lead was found under Lake Wendouree; this run of wash was dry and unlike that previously worked. The

first machine yielded 28 oz. of rough gold, including pieces half an ounce in weight. The washdirt averaged about 6 ft. in thickness, but the run was narrow. Several narrow tributary gutters were found while the main gutter was being followed to the westward. The lead was worked downstream for over a mile; the level was then lost, and an incline drive was put in for a further distance of 600 feet. Near the end of this drive the values of the washdirt improved, and the lead widened. In July, 1870, the downstream workings met with a layer of basalt, which was regarded as the fourth rock; the lead near this narrowed from 90 feet to 40 feet. In 1870, 38 machines of washdirt from the main gutter averaged 19 oz. 12 dwt. per machine. In 1871, as the available ground was blocked out upstream and the wash was improving downstream, the company was reorganized as the City of Ballarat Company (see p. 82. Notwithstanding that the Durham Company had expended over £38,000 of capital, exclusive of the gold won from the mine, the City of Ballarat Company began to sink a new shaft to test the downward continuation of the Swamp lead.

#### EUREKA CEMENT COMPANY.

The Eureka Cement Company, which was formed in 1860, provides an illustration of the methods in vogue at that period for the systematic working of old ground. The works were erected near the site of the Eureka Stockade, and consisted of eight heads of revolving stamps with copper plates and ripples. The material crushed was conglomerate or cement, which had been proved by trial crushings to contain up to half-an-ounce of gold to the ton. For a considerable time the company crushed the *débris* from the old shafts, but in 1861 a supply of wash was obtained from a layer from 4 ft. to 8 ft. thick at a depth of 80 feet to 100 feet below the surface. From 90 to 100 tons treated per week yielded 5 dwt. to 14 dwt. to the ton. In 1861, unsuccessful experiments were made with patent amalgamators, which were therefore discarded. Payable returns were obtained throughout 1861, but tests made later showed that a considerable amount of the gold was lost in the tailings. The company continued working until 1862.

#### GREAT EXTENDED COMPANY, REDAN, OR GREAT REDAN EXTENDED COMPANY.

This company was registered in September, 1856, for a claim of 80 men's ground on the Redan lead. The site lay south of the Kohinoor and Band of Hope companies' claims. Shaft-sinking began in February, 1857; the shaft measured 8 ft. 6 in. by 3 ft. 3 in., and was divided into two compartments. Much trouble was experienced in sinking. The strata passed through to bed-rock were:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (First rock) .. .. | 80 |
| Red clay .. .. .. | 14 |
| Basalt (Second rock) .. .. | 55 |
| Red clay .. .. .. | 36 |
| Basalt (Third rock) .. .. | 35 |
| Clay .. .. .. | 10 |
| Fine drift sand .. .. .. | 35 |
| Clay headings and wash .. .. | 43 |

At the base of the first rock the flow of water was 17,000 gallons per hour, and in the second rock 30,000 gallons per hour. Sinking through the 30 feet of drift where the shaft was sunk by driving piles and using a frame, occupied eight weeks. It took three years to sink the shaft which bottomed within 15 feet of the gutter level and was sunk to a depth of 375 feet. A level was opened out at 360 feet from the surface. The first gold was obtained in April, 1860, but the gutter was not reached until 23rd June, 1860, the yield to the end of that month being 907 oz. Up to this date calls amounted to £6,280, exclusive of the labour of the shareholders for a period of over three years, which would amount to about £30,000. Very rich patches of wash-dirt were found in the gutter workings. On 23rd August, 1860, 138 oz. of gold were obtained from one dish of dirt, and in September 316 oz. from one machine of wash-dirt. In September, shares were for sale at £1,000 each. By the end of 1860, the output from the mine was 6,272 oz. of gold. Nuggets were fairly plentiful, and some were of a fair size. In April, a nugget of 132 oz. was found, and shortly afterwards another of 84 oz. In 1861, the New Zealand rush caused a depression in alluvial mining in the district, and this company's shares, which were saleable at £2,000 in August, 1861, were available at £1,500 in the following September, although the lead became richer as it opened up, and the yields amounted to 100 oz. and more per day.

In December, 1861, litigation with the Band of Hope Company arose over the frontage boundaries; the Band of Hope Company was registered for the next claim on the Golden Point lead in succession to the Kohinoor Company, while the Great Extended Company was registered for the Redan lead but was actually working the Golden Point lead to the Kohinoor boundary. The Great Extended Company suggested an amalgamation with the Band of Hope Company, and offered the latter 120 feet of ground already opened up, together with £2,000 cash, but this was not accepted. The lawsuit (see p. 21) became notorious in consequence of the amounts involved and the legal expenses incurred.

In 1861, the mine produced 15,365 oz. of gold and occupied a leading position. Dividends ranging up to £100 per share per fortnight were paid towards the end of the year.

During eleven days in February, 1862, the output was 2,311 oz. of gold. By September, 1862, shares in the company were saleable at £3,200 each. In November, 1862, several nuggets were found in ground secured from the Kohinoor Company by an injunction order, the largest, found on 27th November, weighing 129 oz. For the last seven working days in the year 1862, the yield was 1,300 oz. of gold. During 1862, the triangular suit between the Great Extended, the Kohinoor, and the Band of Hope Companies was settled. Up to 1st May, 1862, dividends amounted to £106,000 (£1,325 per share), and calls to £6,280. By the end of 1862 the total gold yield was 44,670 oz. The gutter had been proved to be 200 ft. wide, with wash-dirt on both sides of the workings; the wash was 6 ft. thick, and 450 truck-loads per day were sent up for treatment. In December, 1862, nuggets of 1 oz. to 5 oz. amounted to 300 oz. The water in the alluvial was found to be corrosive and to destroy the rails, timber, and also, it is recorded, brass valves, &c.

The mine was swamped in September, 1862, but in March, 1863, work was resumed on the reef-wash on the Redan side of the main gutter, and a nugget of 34 oz. was found. This ground kept the company engaged until July, 1863. The monthly output in 1863 was about 15,000 truck-loads of wash. To the end of the year the yield was 67,531 oz. of gold, valued at £264,967, dividends amounted to £225,010, and £12,410 was called up during the year to buy into the Band of Hope Company.

During 1864, a trial crushing from a quartz reef found in the workings yielded 12 dwt. of gold per ton, and a second crushing yielded 148 oz. from 150 tons.

The boundaries and legal disputes were finally adjusted in this year. During August, 1864, the company was registered under the Limited Liability Act with a share register of 4,800 shares, the company paying £20,000 to buy into the United Extended Band of Hope Company. Up to this time, the dividends of the co-operative company amounted to £257,170 and gold yield to 77,437 oz., valued at £305,256.

In 1865, a wide extent of wash-dirt was worked near the Kohinoor Company's boundary, the lead having taken a bend near this point. On the eastern side of the gutter the reef-wash was taken for a height of 7 feet, 5,040 truck-loads a week being mined from this source. In October, an upper level was opened to work an area of reef-wash in the northern part of the mine. There was a marked decrease in the yields throughout the year. To the end of 1865 the total output from the mine was valued at £410,641; and £321,450 had been paid in dividends. A drive, which was put in south-westerly, intersected the quartz reef at a point 500 feet south of where it was originally worked; the reef was 6 ft. wide, and showed a little gold.

During 1866 the title of the company was changed to the Great Redan Extended. Work was confined to the reef-wash east of the gutter; this wash averaged 30 ft. in width for a time, but expanded to 150 ft. at one point; it was 6 ft. thick, and most of it was cemented. The yields fell away still further during 1866, but monthly dividends, absorbing £1,200 a month, were kept up till June, and shortly afterwards the shaft was abandoned.

On 7th August, 1866, the sinking of No. 2 shaft, on the east side of Pleasant-street and south of the Kohinoor Company's boundary, was begun. This shaft passed through:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (First rock) .. .. | 95 |
| Clay .. .. .. | 12 |
| Basalt (Second rock) .. .. | 90 |
| Clay .. .. .. | 3 |

Bottomed at a depth of 200 feet. A good deal of water was encountered near the base of the first rock, but the second rock was dense and quite dry. In nine months the shaft was sunk 250 feet, and at this depth a level was opened out north-westerly. The north-west drive proved deep ground under Pleasant-street, but a drive due west from the shaft passed under shallow ground. To work the deep ground No. 2 shaft was deepened to 320 feet by October, 1867. Work at No. 1 shaft was stopped on 15th July, 1866, as soon as the sinking of No. 2 shaft was decided upon. In 1868, a prospecting drive was put in westerly from No. 2 shaft and at 455 feet a blind shaft was risen 80 feet; a drive from the top of this blind shaft struck the deep ground, which had been passed over in the upper level, at 60 feet. The wash, however, was poor and all prospecting drives in wash were stopped in April, 1868. A drive was then put in to test the quartz reef, but as no payable ore was located, the company was wound up in August, 1868.

The total dividends paid by this company amounted to £327,750. To the end of 1865 the value of gold won was £413,588; the gold obtained during 1866 amounted to 6,714 oz., which increased the total value to £438,289.

The yearly returns for the company were:—

| Year. | Gold won. | Dividends. |
|---|---|---|
| | oz. dwt. gr. | £ |
| 1860 .. .. | 6,272 18 7 | 20,000 |
| 1861 .. .. | 16,364 12 15 | 40,000 |
| 1862 .. .. | 23,033 11 12 | 79,040 |
| 1863 .. .. | 23,016 9 0 | 85,970 |
| 1864 .. .. | 17,467 8 14 | 49,440 |
| 1865 .. .. | 18,243 0 0 | 49,400 |
| 1866 .. .. | 6,713 18 0 | 3,900 |
| | 110,111 18 0[1] | 327,750 |

[1] Gross yield; much of the gold was sold as gross by this company at £3 18s. 10d. per ounce, while its bar gold brought £4 1s. 6d. per ounce. The total yield was valued at £438,289.

GOLDEN CORNER COMPANY.

This company, which was formed in 1866, held an area of 12 acres of freehold land at the south-western corner of Sturt and Pleasant streets. The shaft of the Leviathan Company was cleaned out to a depth of 267 feet, and a start was made to work the reef-wash proved by the Sir William Don Company. A drive south-west from the shaft was put in for 207 feet, and at 75 feet a rise broke through into a mixture of wash and red clay dipping south-west. This was proved to be a fall towards the Inkerman lead.

Prospecting operations in the vicinity of the shaft were carried on without success for several months, and the company was wound up without locating anything payable. The wash proved was white, and from 3 ft. to 5 ft. thick.

GOLDEN GATE COMPANY, REDAN LEAD.

The Golden Gate Company began shaft-sinking in April, 1857, on a site at the south-western corner of Skipton and Cobden streets. The shaft was 5 ft. by 3 ft. in the clear. Strata passed through to bedrock:—

| Formation. | Thickness. feet. |
|---|---|
| Clay and soil .. .. | 5 |
| Basalt (First rock) .. .. | 65 |
| Clay .. .. .. | 7 to 8 |
| Basalt (Second rock) .. | 94 |
| Clay .. .. .. | 60 |
| Basalt, traces (Third rock) .. | 2 |
| Clay .. .. .. | 43 |
| Basalt (Fourth rock) .. | 8 |

The shaft bottomed at 280 feet, and was sunk to 302 feet. Sinking through the last 6 feet of the second rock occupied the party for nine months owing to the great influx of water.

In January, 1859, the shaft was bottomed close to the Redan gutter. The claim yielded handsomely. In July, 1859, as much as 68 oz. of gold was obtained from a machine. Much trouble was experienced with water from the second rock during the working of the mine, notwithstanding that over 100 feet of clay intervened between the washdirt and the basalt. In November, 1859, the mine was swamped out, and it remained idle for several months in order to allow the crevices in the clay to close up.

During 1860, some rich yields were obtained. For the week ending 24th April, the return was 400 oz., and for the following week 700 oz. The return for June, 1860, was 2,458 oz. In October, no less than 1,220 oz. resulted for a week's work, and the fortnightly dividend was £111 per share (98 shares). By the close of 1860, the returns began to decrease. The total gold yield from the mine to this date was 25,560 oz. In July, 1861, a new block of ground gave improved returns, the fortnightly average for July and August being about 580 oz. The fortnightly dividends ranged

from £21 to £38 per share. In December, 1861, the claim was worked out, operations ceased, and the property later on passed into the hands of the Band of Hope Company, which utilized the shaft in working a portion of its claim.

The company began work in 1857, and struck gold in 1859. Up to the time of dissolution, December, 1861, the total yield of gold was 31,059 oz., valued at £123,026, and the total expenditure on the mine was £18,110. The expenses per share were £189, and the dividends per share. £1,181, in addition to a share in the sum of £1,217 16s. realized by the sale of claim and plant.

GREAT NORTHERN FREEHOLD COMPANY.

This company, which was formed in 1867, held a block of ground north of Webster-street, and east of Drummond-street, including the area held originally by the Allied Armies Company, and later by the Emerald Company, as well as two adjacent allotments on the eastern side. The first shaft bottomed at a depth of 136 feet after passing through 7 feet of washdirt, which yielded at the rate of 3 dwt. of gold to the tub. The object of the company was to prospect the high reef-wash in the neighbourhood of the worked-out Inkerman lead. The Allied Armies Company in 1860 had driven within 30 feet of the ground struck by this company. Gold was discovered in April, 1867, and by 2nd of November of that year 1,274 oz. was won. Wash 10 ft. thick and 100 ft. wide was proved by drives. A second run 80 ft. in width was discovered from No. 3 shaft, sunk near Webster-street. Throughout 1867 the output steadily increased, working expenses were low, and good dividends were paid to the shareholders. By the end of the year, 3,211 oz. of gold, worth £12,757, had been won, and £5,625 had been paid in dividends.

Eastwards from No. 3 shaft the washdirt widened to 300 feet, and was blocked out to the boundary of the Webster-street Company's claim. Rich wash up to 10 ft. thick was located early in 1868. The return for the first quarter of the year was 5,790 oz., but the yields fell away, and early in 1869 the mine was worked out. The yields, as far as ascertainable, were:—

| Year. | Gold Yield. oz. | dwt. |
|---|---|---|
| 1867 .. .. .. | 3,210 | 12 |
| 1868 .. .. .. | 10,581 | 0 |
| 1869 .. .. .. | 481 | 8 |
| Total .. .. | 14,273 | 0 |

The dividends to April, 1868, amounted to £19,687.

GREAT REPUBLIC UNITED COMPANY.

(Inkerman Lead.)

This company of 80 shareholders held an area extending north of Sturt-street to near Main-street and west of Drummond-street to beyond Pleasant-street, under block and frontage claims, besides the right to mine under Government reserves. The first registration was for a length of 1,500 feet frontage on the Inkerman lead in September, 1857, when the company began operations. The first shaft was sunk in Windermere-street just west of the Hospital Reserve, but it bottomed at less than 100 feet. The sinking was through basalt for the most part. This shaft was too shallow, and was, therefore, abandoned and filled in. A second shaft was sunk west of Ascot-street, and north of Sturt-street, to a depth of 240 feet. By driving about 250 feet north from this shaft, the Inkerman gutter was struck in October, 1858. A third shaft west of Ripon-street, and north of Sturt-street bottomed at 272 feet on the gutter after passing through:—

| Formation. | Thickness. feet. |
|---|---|
| Surface soil .. .. | 7 |
| Basalt (first rock) .. .. | 130 |
| Stiff clay .. .. | 18 |
| Basalt (second rock) .. | 29 |
| Mixed clay .. .. | 83 |
| Washdirt .. .. | 5 |
| Bedrock .. .. .. | 6 |
| Total depth of shaft .. | 278 |

A drive from this shaft along the centre of the gutter broke through to the No. 2 shaft workings about midway between the two shafts. The main gutter (the Inkerman) was from 100 ft. to 250 ft. wide, and the washdirt was from 4 ft. to 7 ft. thick. Near No. 2 shaft a small run was discovered near the main lead, but it was very difficult to work, as the washdirt was mixed up with hard cement. This small run was supposed to be merely a side branch that would rejoin the main lead lower down. While prospecting for this run in the vicinity of the No. 3 shaft, the company discovered a tributary lead, which was proclaimed the Republic lead in June, 1862; the gutter was 250 feet from the surface, and 55 ft. wide, and the washdirt, which consisted of large boulders mixed with tough clay, was 8 ft. thick. In 200 feet of driving the lead rose 20 feet.. This tributary lay on the north side of Sturt-street, and was followed up in a frontage claim that encroached on the Sir William Don Company's ground, and led to costly litigation. The Republican lead proved exceptionally rich in places. One and a half machines of washdirt gave 355 oz. soon after the lead was found.

During 1861, some good yields were obtained; in September, 268 oz. for a week; in November, 451 oz. and 505 oz. for two consecutive fortnights; and in December, 800 oz. for one fortnight. Notwithstanding the number of expensive delays owing to swamping out, repairs and additions to the machinery, litigation with the Hand in Hand Company, and other items, the yield for the year was 5,595 oz.

Owing to the frequent inbursts of sand and drift at No. 3 shaft, the pumps were removed and replaced by tanks.

The cement ground from near No. 2 shaft yielded on crushing 15 dwt. per ton, and in July, 1862, 30 tons left £30 profit after carting, crushing, &c.

While prospecting the ground adjoining the Great Republic Claim on the north, the Ballarat Mill Company discovered a run of deep ground near the boundary of the two claims. The Great Republic Company sank a shaft (the Lemonade) in a freehold block, and opened out a level in a south-westerly direction at 160 feet, after passing through about 140 feet of basalt. At 200 feet from the shaft the lead was found 12 feet above the level. Drives north and south on this lead in December, 1863, proved the washdirt to consist of large boulders in tough clay. The first machine (31st October, 1863), gave 8 oz. 13 dwt., another (15th December), 10 oz., and a third (17th December), 17 oz. 9 dwt. The wash was 7 ft. 6 in. thick. Yields from this lead soon fell away, and early in 1864 the shaft was abandoned.

The main gutter, owing to the dangerous nature of the ground, had been allowed to remain unworked for over two years, but in 1863 blocking out was resumed, and the remaining portion of the lead within the claim was worked out by October, 1863, when the Catch-me-who-can shaft was abandoned.

In 1863 and 1864 costly litigation with the Sir William Don Company resulted in the Great Republic Company having to pay £1,154 damages for gold taken out of the Sir William Don ground

To the west of No. 3 shaft a large reef was passed through, and as the alluvial was found to be invariably richer near this reef than elsewhere, a trial crushing of the quartz was made in August, 1863.

In June, 1864, the company wound up, and all operations ceased.

The total amount of gold won by this company amounted to 29,506 oz., valued at £117,455 12s Dividends paid totalled £88,118.

HAND IN HAND COMPANY.

This company, consisting of 80 shareholders, registered in August, 1857, under the frontage system for 22 feet per man on the Inkerman lead It was the last company to register, owing to the prevalent belief that the Inkerman lead would run south and join the Golden Point lead. The first shaft, sunk in the block south-east of Pleasant and Sturt streets, passed through the following strata:—

| Formation. | Thickness feet. |
|---|---|
| Surface soil and clay .. | 6 |
| Basalt (First rock) .. .. | 114 |
| Clay .. .. .. .. | 6 |

The shaft bottomed at 125 feet, and was carried down 285 feet. At this depth two parallel drives, about 40 feet apart (a main drive for the workings and an air drive for ventilation) were driven for 1,400 feet before reaching the gutter in September, 1859, at a point below Pleasant-street. The gutter was worked upstream to the Great Republic boundary; it was about 265 feet from the surface, from 50 ft. to 250 ft. wide, and carried washdirt from 6 ft. to 8 ft. thick. The Leviathan Company's shaft, which was situated at the south-western corner of Sturt and Pleasant streets, only 300 feet from the gutter, was bought by the Hand-in-hand Company, and was used for working the downstream portion of the lead; this shaft was 330 feet in depth, and the deepest point of the lead within the claim was 300 feet below the surface. The drives down the lead were upwards of 3,000 feet in length, over 2,000 feet being in washdirt. Much water came from numerous quartz veins in these drives. Shortly after reaching the washdirt the boundaries were the subject of legal proceedings by the Great Republic Company and delay resulted in both mines. During 1859 and 1860, small dividends were paid, but they seldom amounted to more than wages. In 1861, the ground in the vicinity of the Great Republic claim was worked out, and prospecting operations were carried on under Sturt-street, most of the wash being brought up by way of the Leviathan shaft. In common with other mines in the vicinity the Hand-in-hand mine was several times flooded; the Great Republic mine, with which it was connected, was especially subject to flooding, and was swamped out no less than ten times in three years. A nugget weighing 27 oz. was discovered in April, 1861. In June, 1861, a new run of wash was located, and this led to the taking up of the adjoining claim (known as the Sir William Don), by the working shareholders with the concurrence of the sleeping shareholders. The No. 1 or Hand in Hand shaft was transferred in 1863 to the Sir William Don Company. For the quarter ending October, 1861, the amount paid in dividends was £69 per share. For the year ending 1861, the company obtained 4,224 oz., which, in view of the difficulties encountered, was regarded as encouraging. The new runs gave good returns.

In August, 1861, the company began to sink No. 2 shaft near the Band of Hope Company's shaft with the idea of striking the Inkerman lead after it emerged from the Southern Cross claim, as it was then supposed that the Inkerman lead joined the Swamp lead and took a southerly course. Some bores put down prior to this date (August, 1861), by the Perseverance and the Redan Companies (now disbanded) had reached the base of the third rock at 293 feet in the Perseverance ground, and were not through the second rock at 207 feet in the Redan ground. These results tended to support the deep ground theory. No. 2 shaft was sunk to a depth of 115 feet, but was then abandoned for a considerable time.

During 1863, the washdirt proved from the main shaft and the Leviathan was very poor, and towards the end of 1864 the company suspended operations at the old shafts, and resumed the sinking of No. 2 shaft near the Band of Hope company's shaft.

From the month of August, 1859, when the first gold was won, up to the end of July, 1862, the yield amounted to 13,363 oz., valued at £52,563; dividends amounted to £34,086 10s., or £426 per share. By the end of February, 1863, the total output of the mine was 13,934 oz. of gold, valued at £54,838, and the dividends totalled £34,766.

In 1864, sinking was resumed at the No. 2 shaft, and was continued throughout 1865, the strata passed through being:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (First rock) .. .. | 135 |
| Clay .. .. .. .. | 10 |
| Basalt (Second rock) .. .. | 80 |
| Clay (false bottom) .. .. | 15 |
| Drift .. .. .. .. | 10 |
| Washdirt .. .. .. | 6 |

The shaft bottomed at 260 feet, and was continued to 420 feet. The main level was opened out at 410 feet. In the drift overlying the bottom a heavy flow of water was struck, and 10 inches of "puddling" had to be put in to hold it back. After bottoming the shaft, the rate of sinking increased from 4 feet to 6 feet each twenty-four hours. An upper level was opened at a depth of 315 feet and driven to the wash, which was found at a depth from 270 feet to 310 feet below the surface. On the 21st September, 1866, this shaft, together with the whole of the claims, was transferred to a new company formed by the amalgamation of the Hand in Hand Company with that portion of the Band of Hope Company which lay within the public park (see p. 98).

THE HURDSFIELD GROUP OF MINES.

The Hurdsfield rush (1880) affords a striking example of boom flotation, fortunately the last of its class in Ballarat. Within a few weeks the following companies were formed to work a run of gold under a mile long:—

Butler's United Freehold.
North Butler's Freehold.
Barry's Hurdsfield.
Pott's Hurdsfield.
No. 2 North Hurdsfield.
Head Hurdsfield.
Golden Hurdsfield.
Hurdsfield Union Extended
Royal Hurdsfield.
United Hurdsfield Grand Junction.
Hurdsfield Queen

Hardy's Freehold.
Baird's Hurdsfield Extended Freehold.
Hoiland's Hurdsfield Freehold.
Keily's Hurdsfield Freehold.
Duke's Hurdsfield.
Vallance Freehold.
Baird's Hurdsfield.
Thomas's Hurdsfield Freehold.
No. 2 North Hurdsfield Freehold.
Martin's Freehold.
Butler's Extended Freehold.
Goulding's Freehold.
The Father Hurdsfield Quartz and Alluvial.
The Great North Hurdsfield
Superb Hurdsfield.
Costin's Hurdsfield Freehold.
No. 2 Grand Central Hurdsfield
Great North Hurdsfield.
Telegraph Hurdsfield.
Stansfield Hurdsfield.
Evan's Hurdsfield.
Jones's Freehold.
No. 2 Butler's United Freehold.
King Hurdsfield.
Hurdsfield Freehold.
Victoria Hurdsfield.
No. 2 East Hurdsfield.
Hurdsfield Union.
South Hurdsfield.
Costin's Hurdsfield.
Glasgow Hurdsfield.
North Hurdsfield Extended.
McDonald's Freehold.
Anderson's Freehold.
Highgate Quartz and Alluvial.
Happy Hurdsfield.
The Orient Hurdsfield.

The rush began with the discovery of a small area of exceptionally rich reef-wash situated between two worked-out gutters. Being situated in a closely populated part of the city, the ground had been sub-divided into small freehold allotments, many of them only a quarter of an acre in area. These allotments were secured for mining purposes, houses were removed, and whims were erected in their place, while shaft-sinking in the midst of gardens went on at a great rate. Several thousand ounces of gold were quickly won, and many dividends were paid by a lucky few; but of the several score of companies formed, some never started, others met with no success. Within a couple of years the area was deserted. Notes are given below on some of the claims:—

The Hurdsfield Freehold Company sank its shaft (No. 1) near the junction of Lyons-street and Sebastopol-street to a depth of 240 feet, and purchased the shaft of the Young Hurdsfield Company for a No. 2 shaft. 225 machines washed during the latter part of 1880 yielded 1,985 oz. of gold. By January, 1881, the gold won was valued at £21,232 5s. 10d., and £9,900 was paid in dividends.

The East Hurdsfield Company started shaft-sinking on 25th April, 1880. In May the shaft was bottomed on 5 feet of good payable washdirt. Between 1st June and 22nd October the return was 4,864 oz. of gold, which realised £18,842. Within eight weeks of beginning to sink the shaft a dividend of 2s. per share was paid. The shaft was sunk to 414 feet, and at 404 feet a cross-cut east cut a lode-track at 90 feet from the shaft. This track, which carried black slate and mineralized quartz, was driven on north for 30 feet.

The North Hurdsfield shaft struck the second rock at 80 feet in 1880, and at 80 feet south of the shaft a drive between the first and second rocks struck wash that rose for a time and then dipped off suddenly to a run of wash which yielded 115 oz. of gold to the machine. The shaft was deepened to command this run, and an area of payable washdirt proved, which yielded 3,000 oz. of gold.

Butler's Freehold Company, for the quarter ending September, 1880, won 1,436 oz. of gold, and divided £2,400.

The New Kohinoor No. 3 Company in 1880 sank a shaft to a depth of 80 feet, but the water then proved too heavy, and the shaft was abandoned. A second shaft to the north-west of Butler's claim passed through 150 feet of basalt, bottoming at 220 feet on 3 feet of wash with a little gold. The shaft was sunk to 260 feet, and opened out to the wash, which proved poor.

The Kohinoor Consols Company cleaned out an old shaft in 1880, and tried a number of machines of wash from a large body east of the shaft, but these proved unpayable.

The New Kohinoor Extended Company sank its shaft to a depth of 140 feet in 1880, and opened out east in a large deposit of wash, trials of which yielded 23 oz. and 24 oz. to the machine. These yields were not maintained, and all work ceased early in 1881 from want of funds.

The No. 4 New Kohinoor Company sank its shaft to 260 feet during 1880, and opened out west at 250 feet, but was unsuccessful.

INKERMAN AND DURHAM JUNCTION COMPANY.

This company was formed in 1866, and secured the ground formerly held by the Tannery Company (see p. 98), whose shaft was utilized. A main drive was put in 450 feet westerly at a depth of 400 feet. Several bores from this drive failed to locate any wash. The Western Freehold Company, adjacent on the south, in the meanwhile located a profitable area of reef-wash at a shallow level; this discovery induced the Inkerman and Durham Junction Company to abandon the deep levels, and to open out at a depth of 240 feet, and to drive south-easterly. In September, 1866, gold-bearing wash was located. The wash-dirt consisted of fragments of slate, sandstone, and quartz, with sandy clay. The reef-wash was found to be payable, but the gutters or runs were invariably poor. A payable lead was located parallel to the Inkerman, while the Inkerman lead to this claim was unpayable where worked by the Victoria and Southern Cross Companies. The air was very bad, but good ventilation was secured by connecting the reef-workings to the St. Leger Company's drives.

The wash-dirt was found to dip rapidly in parts, and a second shaft was, therefore, sunk south-west of No. 1, and near the eastern side of the park. A main drive was put in north-westerly to command the deeper ground; this drive passed through a large auriferous quartz reef, but no attempt was made to work it. The wash-dirt in the workings from No. 1 shaft was proved to be about 200 feet wide, and to extend for 700 feet in the claim. For the quarter ending March, 1868, 65,470 trucks of wash-dirt were raised, and drives were extended 9,100 feet.

The company struggled on until 1870, without finding any profitable wash. No dividends were paid. The total gold yield amounted to 6,153 oz. The following are the recorded yields:—

| Year. | oz. | dwt. | gr. |
|---|---|---|---|
| 1866 .. .. .. | 196 | 6 | 18 |
| 1867 .. .. .. | 4,656 | 8 | 6 |
| 1868 .. .. .. | 506 | 0 | 0 |
| 1869 .. .. .. | 667 | 15 | 0 |
| 1870 .. .. .. | 127 | 0 | 0 |
| | 6,153 | 9 | 18 |

KOHINOOR COMPANY.

The Kohinoor Company of 40 shareholders began to sink a main shaft in 1857, near the south-west corner of Urquhart and Ascot streets. The strata passed through in this shaft were:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| Surface clay .. .. .. | 6 |
| Basalt (first rock) .. .. .. | 80 |
| Clay .. .. .. .. | 22 |
| Basalt (second rock) .. .. | 60 |
| Clay .. .. .. .. | 150 |

The first level was opened out at a depth of 380 feet, and a southerly drive was put in 1,100 feet before the gutter was reached. This level proved too shallow, and in August, 1860, the shaft was deepened to 475 feet, and a lower main level was opened at 460 feet. The gutter was reached at over 1,000 feet from the shaft by an incline drive. From the first the mine was noted for nuggets. Gold was first found in August, 1859, and fortnightly dividends began the following month with £26 per man. In January, 1860, nuggets of 70 oz. and 30 oz. were found. On the 27th July, 1860, two more nuggets (834 oz. and 50 oz.) were discovered close together, and these, together with the yield from the puddling machines, increased the fortnightly dividend to £140 per share. From August, 1859, to August, 1860, the gold yield amounted to 6,056 oz., and the dividends to the end of July, 1860, totalled £398 per man.

From August, 1860, to August, 1861, shaft-sinking and driving the lower level were in progress, and no gold was won. One of the chief reasons that led to this deep sinking was the swamping out of the workings in August, 1860, and this trouble was not mastered until October of the same year. In August, 1861, on reaching the wash-dirt again, dividends were resumed. From the time of striking the wash the yields gradually increased, and by the end of 1861 were over 200 oz. a week. In December three nuggets, weighing 50 oz., 123 oz., and 17 oz., were found. In 1862, the output increased still further, and by 5th May, 1862, the total gold yield was 15,281 oz., valued at £60,374.

In March, 1862, a nugget weighing 320 oz. was discovered, and in May another of 32 oz., besides smaller pieces ranging from 1 oz. to 15 oz. In common with the other large gold-producing companies on the field, the Kohinoor Company entered into litigation with the adjacent mines over frontage rights, &c. (see p. 21), and by the end of the year this expense and a decrease in the gold yield led to smaller fortnightly dividends. The total output for the year 1862 amounted to 14,269 oz., and the total dividends to £1,110 per fortieth share.

In December, 1862, a new run of wash was discovered 15 feet above the main gutter, the bedrock then rising perpendicularly on one side of the original watercourse. This new wash was 4 ft. thick, and contained coarse gold, a 13-oz. nugget being found along with several smaller pieces. In 1863, the gutter workings were abandoned for a time, as the new run of reef-wash was found to be of better quality, and as the main lower level had to be extended 750 feet to work the gutter more economically. This drive was completed in July, and the gutter was reached at a point 300 feet ahead of the old workings. A trial of the gutter in July, 1863, yielded 64 oz. 4 dwt. of gold to the machine, and included several nuggets, the largest weighing 13½ oz. Later in the month a patch of nuggets totalling 84 oz., was obtained, the largest weighing 32 oz. In June, 1863, the No. 2 shaft was started, but had to be stopped for a time; at a depth of 82 feet work had to cease for a time on account of the whim being unable to cope with the water. During August, 1863, the richest return for one day was 291 oz., including over 100 oz. of nuggets. The wash-dirt which gave this result was 6½ feet thick. A 12-in. pump was installed at No. 2 shaft, work was resumed, and the shaft was bottomed at a depth of 350 feet, within 30 feet of the gutter. Litigation with the Great Extended Company in 1864 resulted in portion of the ground from No. 2 shaft being worked under the inspection of the Court of Mines. The cost of sinking No. 2 shaft, and of erecting the surface plant was £12,000, of which actual sinking absorbed £4,628.

During 1864 the yield was 28,611 oz., and dividends amounted to £73,200. The main gutter was worked for a width of about 250 feet, but the reef-washes at about 15 feet above the level of the gutter were richer. In December, 1864, a trial crushing of 100 tons of quartz was put through, but the yield was not recorded. Two hundred and fifty men were employed during 1864.

In October, 1865, operations at the No. 1 shaft were limited to prospecting by about a dozen men, largely on account of the great distance (1,900 feet), which material had to be trucked to reach that shaft as compared with the shorter distance (1,000 feet) to No. 2 shaft. For the quarter ending October, 1865, the gold yield was valued at £27,020, £14,400 was paid in dividends, and £9,453 17s. 10d. for wages.

For the quarter ending January, 1866, 17,197 cubic feet of wash-dirt was removed. In March, 1866, a tributary lead was struck at 134 feet north-west of No. 2 shaft; the wash was 2½ ft. thick, and yielded 8 oz. of gold from a small machine of wash. Prospecting at No. 1 shaft in 1866, proved only poor ground. A block towards the Golden Fleece on the high reef was tried, about 8,600 square feet being blocked, but it proved to be poor.

In 1867, the Nos. 1 and 2 shafts were connected by a drive, and shortly afterwards No. 2 shaft workings broke through to the workings of the Ballarat Freehold Company under Pleasant-street. Richer wash was met with towards the end of the year.

In April, 1868, the ground of the Cosmopolitan Company was added to the company's holding. Nuggets were still being met with; in August, 1868, two (50 oz. and 24 oz.) were found. The mine was now largely worked by contract. During the quarter ending December, 1868, a length of 11,390 feet by a width of 8 feet was taken out at a cost of 5s. 2d. per running foot. Dividends were kept up throughout the year. In July, 1869, work ceased at No. 2 shaft, the area which it commanded being worked out by May. Over 400 trucks of wash per shift were hauled on an average. For the quarter ending October, 1869, the gold yield was valued at £14,491 2s. 1d.

By November, 1869, the company had won 147,570 oz. 15 dwt. 7 gr. of gold, valued at £590,283, and had paid £304,460 in dividends from an area of 170 acres, only portion of which was worked. For the last quarter of 1869, the number of trucks of wash-dirt raised was 109,864, an average of 436 per shift. This quantity of material yielded 4,005 oz. 19 dwt. 10 gr. of gold, valued at £15,515 3s. 4d. Regular fortnightly dividends were paid, but the profitable ground in sight was small, and in February, 1870, operations ceased,

as the wash-dirt was exhausted. Prospecting from a reef-drive at a lower level was commenced in January, 1870, and a main drive put in. At 550 feet from the shaft a rise broke through to a gutter which yielded up to 20 oz. to the machine. For the last quarter of 1870, 540 feet of this tributary yielded 761 oz. 8 dwt.

During 1871 prospecting operations on the east side of the Golden Point gutter proved low-grade reef-wash up to 6 feet thick. In April, 1871, No. 2 shaft was re-opened, and a level was put in at 220 feet from the surface in a south-westerly direction, but results were poor, and work ceased in this part of the mine before the close of the year. Prospecting operations at No. 1 shaft failed to come up to expectations, the returns for the year being 2,450 oz. 3 dwt.

In 1872 the reef-washes were further tested, but nothing of value was located, and the portion of the mine near the Golden Reef Company was tested.

In 1873 portion of the mine was worked by tributers, who opened up payable reef-wash. Quartz reefs now began to attract the attention of the company; the yield for the year was 4,609 oz. 16 dwt.

In 1874, the property known as the New Golden Reef, which adjoined the claim, was purchased, and steps were taken to prospect the Burra Burra or Township line of reef. For the last half of year 1874, 1,021 oz. 6 dwt. of gold was won, the average per machine being 10 oz. 4 dwt. 6 gr.

Operations in the vicinity of the Milkmaid gutter proved a dark wash early in 1875, but all the available ground was worked out during the year for a yield of 1,404 oz., and towards the close of the year the sinking of the main shaft (which had formerly belonged to the Burra Burra Company) was proceeded with, and from 1876 onwards the mine was known as the New Kohinoor, and was worked as a quartz mine, the alluvial being exhausted. (See p. 167.)

The total yield from the alluvial amounted to 164,157 oz. 17 dwt., worth over £650,000. Dividends totalled £310,000.

The following yields were recorded:—

| Period. | Gold Yield. oz. | dwt. | gr. |
|---|---|---|---|
| To end of 1863 .. .. | 31,054 | 8 | 6 |
| 1864 .. .. .. | 29,153 | 0 | 0 |
| 1865 .. .. .. | 23,779 | 2 | 0 |
| 1866 .. .. .. | 15,331 | 2 | 12 |
| 1867 .. .. .. | 13,070 | 14 | 6 |
| 1868 .. .. .. | 19,465 | 10 | 0 |
| 1869 .. .. .. | 16,475 | 15 | 0 |
| 1870 .. .. .. | 2,845 | 8 | 0 |
| 1871 .. .. .. | 2,450 | 3 | 0 |
| 1872 .. .. .. | 2,807 | 10 | 0 |
| 1873 .. .. .. | 4,609 | 16 | 0 |
| 1874 .. .. .. | 1,711 | 3 | 0 |
| 1875 .. .. .. | 1,404 | 5 | 0 |
| Total .. .. .. | 164,157 | 17 | 0 |

### LADY DON COMPANY.

The ground held by this company in 1866 embraced that originally occupied by the Spes Bona Company, whose shaft was utilized as the main shaft of the Lady Don Company. The chief work was confined to the reef-washes and the Spes Bona lead, and the results throughout were unprofitable. In November 1866, a nugget weighing 606 oz. was found at a height of 60 feet above the gutter in a run of reef-wash 80 ft. wide. During 1867, several smaller nuggets were obtained from the vicinity; the largest, weighing 90oz., was found in March. Towards the end of 1867, the company purchased the claim and plant of the Central Freehold Company and made preparations to exploit further the worked-out ground of the Golden Point gutter. The recorded yields for the company are:—

| Year. | Gold Yield. oz. | dwt. | gr. |
|---|---|---|---|
| 1866 .. .. .. | 802 | 16 | 0 |
| 1867 .. .. .. | 1,058 | 16 | 18 |

### MINERS' RACECOURSE COMPANY.

This company was formed in 1866. The shaft, which was sunk on the race-course, passed through the first rock at a depth of 100 feet, and then through 12 feet of drift and 10 feet of clay before striking the second rock. It bottomed at 180 feet, and, being considered too shallow, was abandoned.

### NEW DON COMPANY.

This company held an area near Sturt-street, west of Drummond-street. A shaft, No. 2, sunk by the Great Republic Company in Ascot-street north, and abandoned, was used by the New Don Company. The shaft was 240 feet in depth. While the Great Republic Company was at work in this shaft, a small run or lead known as the Republican was worked (see p. 86). The New Don Company in 1867 amalgamated with the Arrah-na-Pogue, and worked a run of wash on the western side of the Sir William Don quartz reef, which was 30 ft. wide at this point. The wash-dirt was proved, during 1868, to be over 700 ft. long, more than 150 ft. wide, and from 8 ft. to 9 ft. thick. For the quarter ending June, 1868, the return was 3,052 oz., and a trial crushing of 40 tons of quartz yielded 4 dwt. per ton. A distinct run of wash-dirt which was found 15 feet below the reef-wash, developed into a lead running south-easterly. In 1869, the company ceased operations. The following are the recorded yields:—

| Year. | Gold Yield. oz. | dwt. | gr. |
|---|---|---|---|
| 1867 .. .. .. | 457 | 7 | 12 |
| 1868 .. .. .. | 4,900 | 0 | 0 |
| 1869 .. .. .. | 1,093 | 13 | 15 |

Dividends totalling £1 7s. 6d. per share were paid on a called-up capital of 12s. 6d. per share.

### NEW BALLARAT FREEHOLD COMPANY.

This company, an offshoot of the Ballarat Freehold Company, was formed in February, 1867, and held an area of 5½ acres in the north-western portion of the parent claim, and adjoining the public park. The shaft passed through the following strata:—

| Formation. | Thickness. feet. |
|---|---|
| Clay .. .. .. .. | 3 |
| Basalt (first rock) .. .. .. | 125 |
| Clay .. .. .. .. | 14 |
| Basalt (second rock) .. .. | 35 |
| Drift .. .. .. .. | 68 |
| Wash .. .. .. .. | 4 |

It bottomed at 249 feet.

The main level was opened out at 267½ feet and was put in east about 140 feet. West of the shaft the wash-dirt was struck at 16 feet above the level; it was about 2 feet thick but of poor quality, and yielded about 2 oz. to the machine. The first gold was won in July, 1867, and, though the output was small, by the end of that year the yield was 2,129 oz.

The mine was speedily worked out as the lease was small; the chief objective in forming the company was to prevent the Southern Freehold Company, whose shaft lay 300 feet to the north, from encroaching on the Ballarat Freehold.

For the quarter ending May, 1868, 65,000 superficial feet of wash-dirt was blocked out. By the end of 1868, when the mine was almost worked out, the company had won 5,162 oz. 8 dwt., and paid £5,250 in dividends on a called-up capital of £6,075.

### NEWINGTON FREEHOLD COMPANY.

This company was formed in March, 1866, and consisted of 2,000 shares of £5 each. The claim comprised 19 acres of freehold land on the western side of Pleasant-street, with the right to mine under an adjoining block of 18 acres to the south, for which 500 paid-up shares were given. This block was later on severed from this company, and was worked by the Newington Estate Company. The Newington Freehold claim extended north to Evre-street, and was bounded on the west by the Western Freehold claim. The shaft (10 ft. by 4 ft.), before bottoming, passed through:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt .. .. .. .. .. | 141 |
| Dark coloured drift interspersed with pebbles | 20 |
| Coarse drift and water-worn quartz .. | 19 |
| Gravels, cemented with pyrites .. .. | 1½ |
| Sandy clay with quartz .. .. .. | 5 |
| Cemented gravels .. .. .. | 3 |

The mine was first worked from the 240-ft. level, but later on the shaft was sunk 50 feet deeper, and a level was opened out at 280 feet from the surface. The first clean-up in September, 1866, yielded 125 oz. 10 dwt. of gold from 4 machines. An extensive area of wash-dirt, over 500 feet in width, was proved, and quartz spurs carrying a large quantity of pyrites were met with in the reef-drives. Between September, 1866, and 2nd May, 1867, 10,688 oz. of gold was obtained, and £14,000 was paid in dividends, on a called-up capital of £4,875, though the company had been formed only 13 months previously.

There was a decided fall in the alluvial towards the west. The wash-dirt averaged from 6 feet to 8 feet in thickness, but at times was up to 10 feet.

By the end of December, 1867, the output was 25,599 oz., valued at £103,567, and the dividends amounted to £51,000. A regular output was maintained until June, 1868, when the total yield amounted to 32,174 oz., and the total dividends to £61,000. Shortly afterwards, owing to the poorness of the ground left in the mine, all works ceased, and in November, 1868, the mine was sold off, after a brilliant career of a little over two and a half years.

### NEW LADY DON COMPANY.

This company held nearly 100 acres of freehold land in Ballarat West. Five shafts in all were used to exploit terraces or reef-washes which had their source on the ridge of "high ground" almost under Windermere-street. From No. 1 shaft, originally the Lady Don shaft (see p. 90), the reef-washes reached a depth of 290 feet and were traced north-westerly towards their source for a total distance of 1,500 feet, rising rapidly and showing poor wash 7 ft. wide where the workings ceased. The returns were very poor, and several of the shafts were worked on tribute. The only recorded yield is 18 oz. for the quarter ending December, 1868.

### NEWINGTON ESTATE COMPANY.

The Newington Estate Company, which was formed in November, 1866, acquired the southern portion of the ground held by the Newington Freehold Company. The shaft was sunk to a depth of 300 feet, and two drives were opened out at 290 feet. Eastwards from the shaft a level was put in 153 feet, and two monkey shafts were put up. The western level was driven 180 feet, and ground falling westwards was proved from a rise over this level at a point 110 feet from the shaft. For the quarter ending September, 1867, the return was 450 oz. 10 dwt., but owing to financial difficulties the mine was sold off shortly afterwards.

### NELSON COMPANY AND NELSON AND WELLINGTON COMPANY.

The Nelson Company was formed in May, 1856, and began shaft-sinking on claims Nos. 80-82 on the Frenchman's lead, between the Prince of Wales and the Red Jacket mines. In 1858, the twelve claims held by the Leviathan (Nos. 71-75), the Bullock Horn (Nos. 76-79), and the Nelson (Nos. 80-82) companies were amalgamated. The Nelson shaft was sunk to 240 feet, and was then abandoned, owing to difficulties with water. The shaft begun by the Leviathan Company was then taken in hand. After the adjoining company—the Cumberland, Durham, and Cornish—had been pumping for eighteen months, the Nelson shaft was found to be sufficiently drained to enable sinking to be resumed without difficulty. At a depth of 250 feet much water was met with in the basalt, but the third and fourth rocks were comparatively dry. In July, 1861, the shaft was bottomed in the gutter at a depth of 382 feet, the wash-dirt from the shaft yielding an ounce of gold to the tub. Drives were opened out south towards the Cobbler's lead, which was then supposed to trend northerly, and a wide extent of wash, which yielded from 18 oz. to 20 oz. to the machine, was proved. By the end of 1861, the claim occupied a prominent position as a gold-producer, and returned as much as 340 oz. per week. The lead worked by the Defiance (see p. 83) was found to be identical with that proved in the southern workings of the Nelson Company. In 1861, trouble arose with the adjoining Red Jacket Company, which was also in trouble with the Round Tower Company over the frontage on the Frenchman's lead, and the question of whether the Red Jacket Company had any title to the tributary leads was also raised. The disputed ground was worked by a manager deputed by the Court of Mines, and fourteen months later, when the case was decided in August, 1862, it had yielded 10,091 oz. of gold valued at £39,849. The decision of the Court gave the Nelson Company £13,123 12s. 0½d. in dividends out of this gold. The final winding-up gave an additional £713 0s. 2d. to the Nelson Company. The use of the Red Jacket Company's machinery as well as wages and other expenses were paid out of the gold won, the Nelson Company receiving one-third of the proceeds after paying for the use of the machinery, and the Red Jacket Company paying all other expenses.

In April, 1862, the company discovered and registered the Nelson lead, which proved to be very rich (see Fig. 20, p. 95).

In September, 1862, another lead, thought by some to be the main lead, was discovered and registered as the Wellington lead. The title of the company was then changed to the Nelson and Wellington Company.

During August, 1862, the daily yield from the Nelson lead was over 100 oz. To work the Wellington lead the shaft was deepened 20 feet, making the total depth 402 feet, with a well of 8 feet. A drive was put in to connect with the gutter proved from the upper level. Throughout 1863 good returns were obtained, the Frenchman's lead being followed down stream.

On 5th September, 1864, the co-operative company was re-formed and registered under the Limited Liability Act. At this date the position was:—

| | £ | s. | d. |
|---|---|---|---|
| Calls and receipts (exclusive of labour of shareholders) | 18,658 | 9 | 2 |
| Value of gold raised by the co-operative company | 143,487 | 11 | 0 |
| Value of gold received from the Red Jacket Company | 13,836 | 12 | 2 |
| Total .. .. .. | 175,982 | 12 | 4 |

Dividends, £123,321 9s. 9d.

During 1865, work on the Wellington lead proved the gutter to be about 60 ft. wide with gold visible in the wash-dirt to a height of 4 ft. from the bottom, the wash-dirt being 7 ft. thick. In September, 1865, a second shaft was sunk at 500 feet north-west from No. 1 shaft. This was bottomed in July, 1866, at a depth of 336 feet, and became the main shaft. Drives along the course of the lead broke through into the workings of the Working Miners' Company's No. 1 shaft. Nos. 1 and 2 shafts were connected by a main level, which was driven from the No. 1 shaft. In September, 1867, before abandoning No. 1 shaft, a drive was opened out from the shaft at a depth of 280 feet between the third and fourth rocks, and was driven 270 feet in a south-easterly direction, passing through sand, gravel, and clay, in which two blind shafts were sunk to the top of the fourth rock without finding anything worth working. During 1868, payable ground within the confines of the claim was nearly exhausted, and calls were necessary to carry on operations at No. 2 shaft.

In April, 1868, the company was re-formed under the title of the New Nelson Company. Work was carried out by this company until early in 1869, when the area was abandoned. The gold yield was:—

| Period. | Gold Yield. oz. | dwt. | gr. |
|---|---|---|---|
| To end of 1865 .. | 52,544 | 3 | 15 |
| 1866 .. .. | 5,649 | 0 | 0 |
| 1867 .. .. | 3,164 | 14 | 14 |
| 1868 .. .. | 426 | 0 | 0 |
| Total .. .. | 61,783 | 18 | 5 |

To this must be added gold valued at £13,836 12s. 2d. received from the disputed ground.

| | £ | s. | d. |
|---|---|---|---|
| Total dividends .. | 174,030 | 3 | 5 |
| Total calls .. .. | 24,785 | 9 | 2 |
| Difference .. | £149,244 | 14 | 3 |

### OPHIR COMPANY.

The Ophir Company sank a shaft at the south-west corner of Webster and Drummond streets in October, 1857, for the Inkerman lead. It bottomed early in 1858, at a depth of 200 feet, and proved a tributary on the eastern side of the main lead. The main lead was from 70 ft. to 80 ft. wide with 3 ft. to 4 ft. of wash-dirt. In 1860, the mine was worked out after having yielded over £26,000 worth of gold.

### PARK COMPANY.

This company was formed in November, 1867, and secured a portion of the public park for its claim. Several shafts were used, and operations were on an extensive scale. No. 1 shaft was originally sunk by the United Hand in Hand and Band of Hope Company (see p. 87). This shaft was deepened from 250 feet to 320 feet by the Park Company. No. 2 shaft was formerly the shaft of the Southern Freehold Company. In 1868, driving from both shafts was carried out. At 200 feet south-west of No. 1 shaft a large area of washdirt was found, while to the north-east and north-west prospecting drives were opening up wash which was found to rise gradually towards the ground proved in No. 2 shaft. In the north-western workings a well-defined quartz reef 8 ft. thick was passed through.

By July, 1869, the mine was opened out to such an extent as to prove the most extensive field of wash yet opened up in the colony, and the yields (about 2,500 oz. a month) verified its quality. This washdirt was taken out over a width of 1,500 feet, and 3,000 trucks were raised and puddled every 24 hours. For the half-year ending July, 1869, the gold won amounted to 14,469 oz. 8 dwt. Steady yields were maintained throughout 1870, but shortly afterwards the output fell away, as the washdirt in the western portion of the mine was not so rich as that in the eastern part. Large portions of the mine were let on tribute, but the yields dwindled, and in 1874 the mine was closed down. The yields and dividends were:—

| Period. | Amount—Gold Yield. oz. | dwt. | gr. | Value—Dividends. £ |
|---|---|---|---|---|
| Nov. to Dec., 1867 .. .. | 2,781 | 0 | 0 | — |
| Jan. to June, 1868 .. .. | 8,457 | 4 | 0 | — |
| July to Dec., 1868 .. .. | 6,580 | 0 | 0 | 10,240 |
| Jan. to June, 1869 .. .. | 14,431 | 3 | 0 | 32,000 |
| July to Dec., 1869 .. .. | 14,337 | 14 | 0 | 32,000 |
| Jan. to June, 1870 .. .. | 15,028 | 18 | 0 | 25,600 |
| July to Dec., 1870 .. .. | 13,054 | 6 | 0 | 32,000 |
| Jan. to June, 1871 .. .. | 9,523 | 7 | 0 | 19,200 |
| July to Dec., 1871 .. .. | 4,499 | 10 | 0 | 6,400 |
| Jan. to March, 1872 .. .. | 1,514 | 0 | 0 | — |
| July to Dec., 1872 .. .. | 1,153 | 13 | 0 | — |
| Jan. to June, 1873 .. .. | 1,346 | 18 | 0 | — |
| July to Dec., 1873 .. .. | 1,911 | 12 | 0 | — |
| Jan. to March, 1874 .. .. | 80 | 0 | 0 | — |
| Total .. .. | 94,699 | 5 | 0 | 157,440 |

The company wound up in March, 1874.

### PHŒNIX COMPANY.

The Phœnix Company, Sebastopol, was formed to work a tributary gutter proved during the late sixties by the Prince of Wales Company. The gutter was located early in 1871, but proved narrow and easily worked at 250 feet. East of the shaft the gutter was 17 ft. wide, while 180 feet west it was 25 ft. wide. Several nuggets, ranging from 1½ oz. to 9 oz. in weight, were found, and a quartz reef showing gold was passed through (this drive was met with by the Sebastopol Plateau No. 1 Company while stoping on the Phœnix reef). Prospecting drives were put in north of the gutter for 473 feet during 1871, but no wash was met with. During 1871, 651 oz. 15 dwt. of gold was obtained. A prospecting drive was put in south for 900 feet, and the Gympie gutter was located, but this proved so poor that the mine was let on tribute early in 1872. Up to 1st May, 1872, the total gold yield from the mine was 790 oz.

### PRINCE OF WALES COMPANY.

This company of 64 shareholders registered for a frontage claim on Cobbler's lead in February, 1857. Boring was carried out to locate the deep ground, and the site for No. 1 shaft was selected

in October, 1859. The shaft measured 7 ft. by 4 ft. Considerable difficulty was experienced in sinking through the drift. The shaft passed through:—

| Formation. | Thickness. feet. |
|---|---|
| Clay .. .. .. .. | 6 |
| Basalt (first rock) .. .. .. | 70 |
| Clay .. .. .. .. .. | 1 |
| Basalt (second rock) .. .. .. | 80 |
| Black clay .. .. .. .. | 2 |
| Basalt (third rock) .. .. .. | 68 |
| Clay and drift .. .. .. | 30 |
| Basalt (fourth rock) .. .. .. | 40 |
| Loose drift .. .. .. .. | 35 |

The shaft bottomed at 332 feet, and was sunk to 350 feet. Gold was found in the drift at a depth of 325 feet. At 340 feet a level was opened out to the deep ground, but when this was reached the mine was swamped. The shaft was deepened to 387 feet in December, 1862. Gold was first obtained in March, 1862, and by 3rd May, 1862, the output was 1,905 oz.; the expenditure to that date was £18,796, not taking into account the labour of 64 men for a period of five years, worth about an additional £40,000. The dividends for this period amounted to £68 per share, or £4,352 in all.

Prior to deepening the shaft, the basaltic rock was found to touch the bedrock in the centre of the gutter. While driving for the alluvial in August, 1862, a quartz reef, 15 ft. wide, was passed through, and a trial crushing of 47 tons, taken from a width of 8 ft., yielded 50 oz. 11 dwt. 12 gr. of gold. This was found to give a better profit than the wash-dirt, and a battery was erected to deal with the quartz. The 340-ft. level was driven 243 feet in bedrock to the lode, and 30 feet further to the wash-dirt. Opposite the shaft the distance to the lode was under 40 feet. At the 340-ft. level drives were put in north and south on the lode, and the reef was taken out for a width of 13 ft. and crushed; the supply from this level, however, was not sufficient to keep the battery going, and the 387-ft. level was continued towards the reef, which it intersected in May, 1863. A drive of 400 feet was then put in south along the line of lode to break quartz and to reach the gutter.

Cobbler's gutter was worked for a considerable distance with varying results, and good reef-wash was found about 30 feet above the level of the gutter. The Prince of Wales lead was again reached in 1863.

In October, 1864, a western lode was discovered which had the same characteristics as the Cobbler's or Prince of Wales lode. At the same time, the main lead was located running in a southerly direction at a point near its junction with Cobbler's lead.

In the month ending October, 1864, 102 men were employed; 48,519 cubic feet of ground was removed, and 17,820 trucks were hauled through the shaft. The cost of mining was £2 9s. 7d. per 100 cubic feet. The output during this period was quartz, 486 oz.; alluvial, 567 oz.; total, 1,053 oz.

In 1865, new machinery was erected, and the number of miners and surface hands increased to over 300. During September, 1865, the number of trucks raised averaged 756½ per shift of eight hours, a double-deck cage being used. A large part of the underground work was carried out by sub-contract both in driving in bedrock and quartz, and also for blocking and stoping.

In 1865, the main lead was stated to be dipping northerly, and a start was made in October, 1865, to sink No. 2 shaft, which measured 10 ft. by 3 ft. 8 in. By January, 1866, the full length of Cobbler's lead that had been proved was 2,000 feet around the bend, and only 700 feet across between the point where the lead entered the claim to the deepest point where proved. The quartz reef had been stoped to a depth of 60 feet below the cap, and for a length of 400 feet with a width of 8 ft. The Prince of Wales lead at this date had been driven on northerly for about 700 feet, the wash averaging 5 ft. thick and 60 ft. across.

No. 3 shaft, which was started in 1866, bottomed early in 1867, at a depth of 320 feet. A main level was opened out at 400 feet, and the gutter was located 220 feet from the shaft at a depth of 370 feet, the bedrock dipping 50 feet in 220 feet. The strata passed through in this shaft were:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (first rock) .. .. .. | 83 |
| Brown clay .. .. .. .. | 15 |
| Basalt (second rock) .. .. .. | 73 |
| Clay .. .. .. .. | 21 |
| Basalt (third rock) .. .. .. | 66 |
| Drift and boulders .. .. .. | 22 |
| Washdirt .. .. .. .. | 4 |

In the first rock, at a depth of 55 feet, a layer of mud or clay, 7 ft. thick, was passed through.

In June, 1867, five distinct leads or tributaries were being worked, in each of which basalt was found resting on the washdirt, and in places on the bedrock. A reef-wash, which gave good returns, was struck east from No. 3 shaft 70 feet above the gutter. The workings from Nos. 1 and 3 shafts were connected in 1867, and a good air circulation was assured. In June, 1867, a winze from the reef-drive, at No. 1 shaft, to work the lode, was carried down to a depth of 35 feet and then stopped. In February, 1869, a blind shaft was sunk at 300 feet south of the main shaft on the line of lode; the stone from the blind shaft yielded 2 oz. of gold per ton.

In 1869, a large "crab hole," 150 feet in length by 100 feet in width, and from 8 to 10 feet below the level of the gutter, was worked from No. 3 shaft, the washdirt from this shaft averaging 12 oz. to the machine for the quarter ending January, 1869. The high-level reef-wash from this shaft opened up well during 1869 and 1870. The deep ground from No. 3 shaft was all taken out by October, 1869.

The blind shaft was sunk to a depth of 510 feet from the surface by July, 1869, and two levels were opened out on the lode at 450 feet and 500 feet. The formation was described as well defined, from 2 ft. to 6 ft. in width, and with gold visible throughout the stone. By the end of 1869, the 500-ft. level was driven to 250 feet south of the blind shaft, the reef ranging from 4 ft. to 8 ft. wide. For the last quarter of this year 1,909 tons of quartz yielded 1,580 oz. of gold, an average of 16½ dwt. to the ton.

Up to the end of October, 1869, the company had expended £564,515, and had won 128,486 oz. of gold, valued at £521,915; the paid-up capital was £33,734, and the dividends aggregated £233,999. At this date the company raised on an average 1,500 trucks of washdirt a day. The equipment comprised six steam engines, nine boilers, nine puddling machines, a battery of sixteen square-head stampers, and a battery of 40 round-head revolving stampers; the total value of this

machinery was estimated at £30,000. Three hundred and seventy-six men were employed, and the monthly wages bill was £2,825, exclusive of contract money.

Throughout 1870, the quartz lode was worked from the balance-shaft, which had reached a depth of 600 feet from the surface by the end of the year. At this depth the lode, underlying west, was cut at 40 feet from the shaft, and was found to be from 1 ft. to 3 ft. wide. At 550 feet from the surface a drive proved the lode to average 3 ft. wide for 100 feet. A marked falling off in the yields, both from the quartz and the alluvial, was noticeable during the year. The alluvial workings were extended over a large area without very encouraging prospects. A main reef drive in a westerly direction was put in from No. 1 shaft, and at 1,900 feet from the shaft a bore broke through into yellow sand at a height of 141½ feet above the level. This drive was continued to 2,170 feet from the shaft, and several bores put up to an average height of 80 feet failed to break through to the wash. As there was no evidence of ground of the required depth in this direction, no further driving was carried out. A main level put in south-easterly located payable reef-wash on the south side of Cobbler's gutter; this wash averaged about 6 oz. to the machine. At No. 2 shaft, the workings were let on tribute. At the No. 3 shaft, a tributary gutter was worked; this gutter was discovered at a point 300 feet east of the main gutter, and where first met with was narrow but rich, 96 square feet of blocking yielding 76 oz. 11 dwt. of gold. Followed westerly, the gutter became wider and richer. During the quarter ending April, 1870, 33 machines of washdirt from this gutter yielded 2,557 oz. of gold, an average of 77 oz. 6 dwt. per machine, but by the end of the year the gutter was worked out, and this part of the mine was let to tributers. A reef-wash was located at 60 feet above this gutter, or 120 feet above the level of the main gutter, and a drive south-east from No. 3 shaft was put in to work a run of reef-wash, which averaged 3½ oz. to the machine.

During 1871 and 1872 the quartz lode, which averaged 4 ft. wide, was worked for six months at the 60-ft. level, and in the stopes above. The alluvial from No. 1 shaft improved. Nos, 2 and 3 shafts were worked by tributers with moderate success, and in 1872 the No. 1 shaft workings were also let on tribute.

In 1873, No. 1 shaft was deepened to work the quartz lode, which had been abandoned for a time. By the end of the year the shaft was 600 feet deep, and sinking was continued. The tributers in the three shafts proved small blocks of payable ground in the vicinity of the worked reef-washes.

In 1874, the main shaft reached a depth of 700 feet, and a crosscut was put in westwards to the lode. Drives north and south were started, but by the end of the year they had not located the payable shoot of stone in the level.

The tributers in the alluvial at Nos. 1 and 3 shafts had indifferent success during the year. Calls totalling 8s. per share were paid during the latter half of the year. The closing down of the Bonshaw Company on the south forced the Prince of Wales Company to build dams in the main reef-drives to prevent flooding; these efforts, however, were unsuccessful, and the water, bursting through at the 400-ft. level, swamped the quartz workings. Shortly afterwards, the alluvial workings were abandoned, and the mine was closed down in 1875. The following yields, &c., were obtained by this company:—

| Period. | Gold Yield. | | Dividends. |
|---|---|---|---|
| | Amount. | Value. | |
| | oz. dwt. gr. | £ s. d. | £ s. d. |
| To end of December, 1862 .. | 5,947 13 13 | 23,410 19 1 | 13,440 0 0 |
| 1863 .. | 8,789 3 0[1] | 35,467 7 8 | 17,952 0 0 |
| 1864 .. | 8,175 15 7[2] | 31,872 1 5 | 21,440 0 0 |
| 1865 .. | 17,472 15 1 | .. | .. |
| 1866 .. | 15,430 13 6 | .. | .. |
| 1867 .. | 31,154 11 10 | .. | 41,713 0 0 |
| 1868 .. | 31,669 7 12 | .. | 59,443 7 6 |
| 1869 .. | 10,739 11 0 | .. | 2,085 15 0 |
| 1870 .. | 8,313 7 18 | .. | 5,880 0 0 |
| 1871 .. | 9,208 10 18 | .. | 7,330 16 6 |
| 1872 .. | 9,045 4 18 | .. | 3,336 0 0 |
| 1873 .. | 6,428 17 0 | .. | .. |
| 1874 .. | 5,265 0 4 | .. | .. |
| 1875 .. | 1,083 6 15 | .. | .. |
| Total | 168,723 17 2 | .. | 250,545 11 6 |

[1] Quartz, 3,874 oz. 11 dwt.; alluvial, 4,914 oz. 12 dwt.
[2] Quartz, 3,900 oz. 13 dwt. 4 gr.; alluvial, 4,275 oz. 2 dwt. 3 gr.

### UNITED RED JACKET COMPANY.

This company began shaft-sinking in May, 1856. The company was registered for claims Nos. 59 to 82 on the White Horse lead, but as it was found later that the White Horse and the Frenchman's leads joined, the title to the claim was disputed by the Nelson Company, and the Red Jacket Company, after bottoming its shaft, was compelled, under an order from the Court of Mines, to work the ground, and divide the gold obtained with the Nelson Company. In sinking the shaft the strata passed through were:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| Basalt .. .. .. | 70 |
| Clay .. .. .. | 20 |
| Basalt .. .. .. | 100 |

The shaft was sunk to a depth of 400 feet. Gold was first obtained in August, 1859, and the mine was placed under the management of the Court in May, 1861. The gutter was only up to 50 ft. in width, but very rich. From gold won in the disputed area, dividends amounting to £14,873 were paid by the Red Jacket Company, which received £1,123 for use of machinery, £5,505 for working expenses, and £4,369 for wages, while working the ground. This area was worked out in August, 1862. The Nelson Company afterwards discovered a tributary lead called the Wellington, and this led to a resuscitation of the company, which was now known as the United Red Jacket. This company was registered in September, 1864, with a capital of £110,000 in 4,400 shares of £25 each. By August, 1865, work in auriferous washdirt was resumed, the Nelson gutter being struck at 800 feet from the shaft. Machinery was erected while drives were put in north to new ground, and south towards the Nelson Company's workings. A large area of poor washdirt was found. In some places there were sandy headings, in others the basalt "kissed" the bedrock, and drives had to be cut in the bedrock to reach the wash beyond. On the western side of the Nelson gutter, reefwash from 1 ft. to 4 ft. thick was proved at a height of 45 feet above the gutter. The Nelson lead was worked northerly (Fig. 20), but the wash was poor. The ventilation was extremely bad, and an air drive was constructed to the old workings in

the horseshoe bend. The extensive reefwash on the western side fell steeply on the western edge towards the Wellington lead; much water was met with on this dip. The wash on this ridge was 6 ft. thick, but was found to be unpayable in spite of repeated tests. To the end of July, 1866, the company had driven 910 feet along the Nelson gutter, which was narrow at first, but widened out to 120 feet, and carried from 2 feet to 3 feet of payable wash. Near the horseshoe bend a small patch of rich, unworked ground was blocked out. For the quarter, 49,580 trucks of washdirt averaged 13 gr. of gold to the truck.

the lead at frequent intervals, proving its width to range from 40 feet to 80 feet. In 1867, the wash improved in the north drive, and a few small nuggets were found, the largest weighing 2 oz. The northern drive was connected to the Albion Company's workings in June, 1867, but a trial of the washdirt in that part yielded only 2 oz. 16 dwt. of gold to the machine. In October, 1867, the workings revealed no payable ground, and the company was wound up.

During its career, this company made calls amounting to £107,905, raised gold valued at £64,772, and paid £14,874 in dividends.

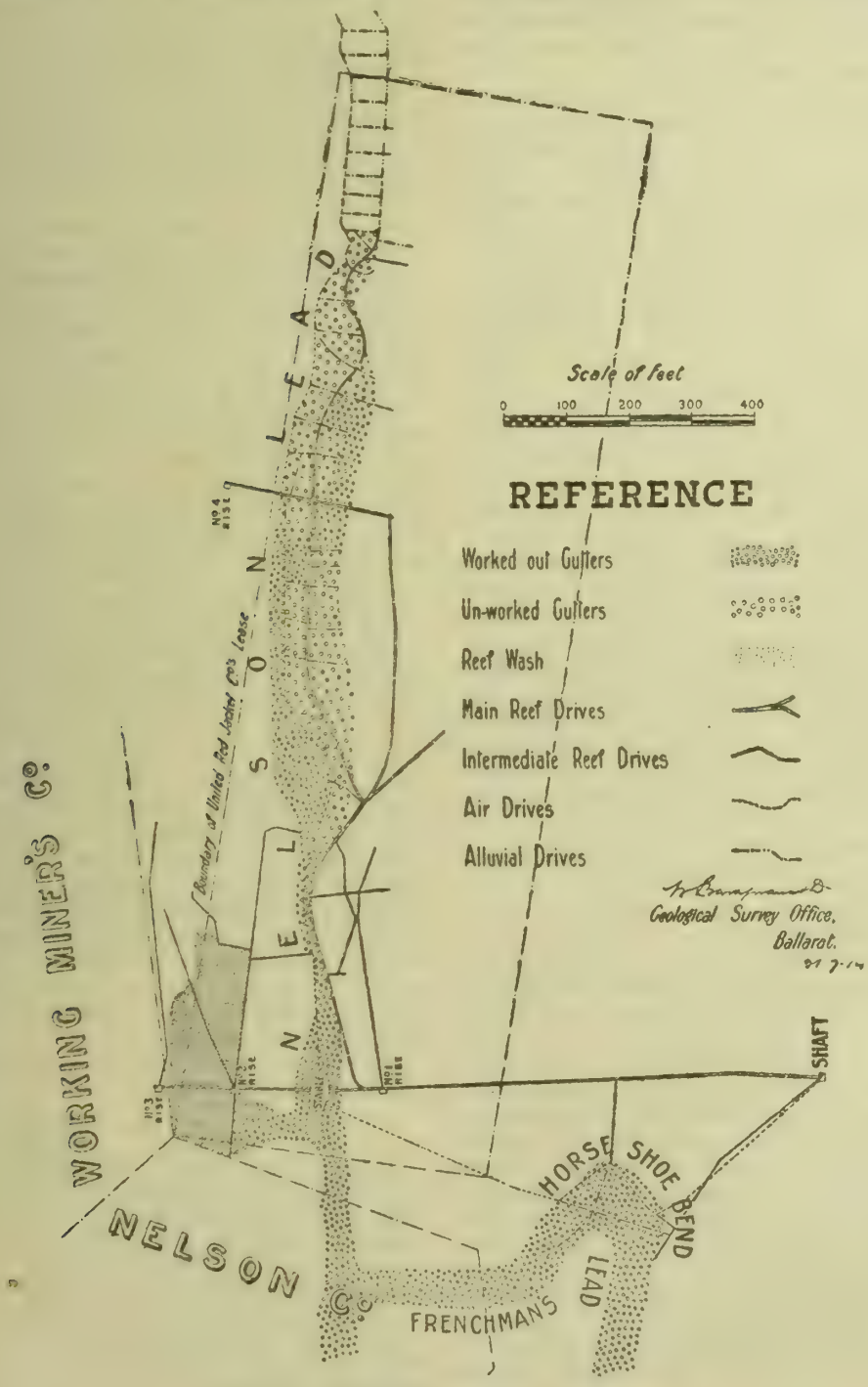



Fig. 20. Plan of the United Red Jacket Mine.

Towards the end of 1866, the prospecting drives in the vicinity of the Frenchman's lead were stopped, as nothing payable could be located in the vicinity of the old ground. The main north drive on the Nelson lead reached a layer of washdirt 6 ft. in thickness, overlain by white boulders cemented with pyrites. Drives were put across

ROYAL SAXON COMPANY.

This company was formed in October, 1858, and occupied a block claim (portion of which took in the Wendouree Swamp), and three freehold allotments west of Pleasant-street, and on the north side of Sturt-street. It consisted of forty shares.

Shaft-sinking was begun on the 14th October, 1858, and the shaft (No. 1) passed through:—

| Formation. | Thickness. ft. | in. |
|---|---|---|
| Surface clay .. .. | 8 | 0 |
| Basalt (first rock) .. .. | 160 | 6 |
| Red clay .. .. .. | 19 | 0 |
| Basalt (second rock) .. | 45 | 0 |
| Clay, gravel and drift .. | 77 | 0 |

The shaft bottomed at 310 feet, and was sunk to 360 feet.

This shaft was 6 ft. 2 in. by 3 ft. 1 in. in the clear, and was divided into two compartments, one for winding, and the other for pumping. Horses were used underground for hauling the trucks. The cost of sinking the main shaft, including all material, was £4,775.

Gold was first found in September, 1859, and by October, 1861, three years after the formation of the company, the dividends amounted to £610 per share. The gold yield to this date was 8,079 oz., sold for £33,793. Three leads were located in this mine, viz., the Inkerman, the National, and the Mill. The Inkerman up to 1863 had not proved remunerative, but the Mill lead was of good quality.

To the end of 1862, the mine workings were comparatively dry, and a 9-in. draw-lift, with a 3 ft. 6 in. stroke working three or four hours daily sufficed to keep the mine dry. The National lead, where worked under the swamp, at a depth of 230 feet to 240 feet, was about 40 ft. wide, and carried washdirt about 5 ft. thick. This, with 1 foot of the bottom and 1 foot of headings, was sent to the puddlers, and averaged about 20 oz. to the machine. The Wheatsheaf or Mill lead junctioned with the National, and was worked upstream in a north-easterly direction. To follow these leads long levels were driven, one 3,000 feet, and another 2,000 feet. In April, 1863, the mine was swamped by water from the basalt. This caused considerable delay and much damage.

In November, 1863, the company started to sink No. 2 shaft on the National lead. This shaft measured 9 ft. by 6 ft. The strata passed through were:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (first rock) .. .. | 145½ |
| Clay .. .. .. | 20 |
| Basalt (second rock) .. | 35½ |
| Clay .. .. .. | 27 |

The shaft bottomed at 228 feet, and was sunk to 260 feet. The main drive was opened out at 250 feet.

In December, 1863, the workings at No. 1 shaft were again flooded. Attempts to drain the mine failed, the water rising to 110 feet of the surface, notwithstanding that pumping was being carried on while sinking No. 2 shaft at a depth of 180 feet. No. 2 shaft was completed in October, 1864, and drives for the leads were put in. The water in No. 1 shaft was taken out by September, 1865, and the shaft was repaired. By the end of 1865 the water was very heavy at both shafts. No. 1 shaft was deepened, and a larger pumping plant was installed, while at No. 2 shaft the Wheatsheaf and Lemonade gutters were worked with moderate success early in 1866. Sixty machines of wash from the Wheatsheaf gutter yielded 640 oz. of gold. In October, 1866, driving on the Swamp lead was stopped, the lead being unprofitable. At this time the pumps at No. 2 shaft were lifting, on the average, 28,080 gallons of water per hour, and the number of trucks of dirt raised varied from 2,500 to 4,500 for the fortnight. At No. 1 shaft, prospecting drives for reefwashes along the banks of the Inkerman lead failed to locate anything payable. At the close of 1866 these works were stopped, and all hands were employed in getting out washdirt, the number of trucks raised in No. 1 shaft being about 4,300 per fortnight.

The Inkerman lead was worked in 1867, and proved to be about 80 feet wide. The wash was about 3 ft. thick, and was poor. Prospecting in the vicinity of the worked out ground was carried on until September, 1867, when the company ceased operations, and was wound up.

From the inception of the company to the end of 1865 calls amounted to £38,080, and had increased to £49,838 when the mine was closed down. The dividends paid to 4th November, 1862, amounted to £36,516, and when the mine closed down they totalled £45,000.

The total gold yield to September, 1867, was 26,633 oz., valued at £105,532, of which 15,272 oz., valued at £60,335, was obtained prior to 4th November, 1862.

### SEBASTOPOL COMPANY.

The Sebastopol Company was formed in September, 1865, to work the reefwashes in three deserted claims on the Cobbler's lead (see p. 17,)—the Cambrian, the Long Funnel, and the Camp—in which the gutter had been worked out. The Camp Company, in August, 1862, sold its claim and machinery to Mr. James Richardson, who worked it until September, 1865, when the Sebastopol Company was formed. The reefwashes were about 30 feet above the gutter. Prospecting operations were carried on continuously during 1866 and 1867 over a distance of 880 feet, but nothing profitable was found.

### SPES BONA COMPANY.

This company was formed in 1863 to re-work the abandoned Golden Point lead, with its smaller tributaries and high-level washes. A block claim, containing 202 men's ground, was marked off. The abandoned shaft of the Homeward Bound Company, at the corner of Eyre and Raglan streets, was utilized. At a level 12 feet above the Golden Point lead, a tributary called the Spes Bona lead was met with in 1865. This lead came in from the west, and ran due east for 700 feet from the main gutter. The washdirt in this lead was 7 ft. in thickness, and yielded 9 oz. of gold to the machine. Much time was spent in cleaning out the old drives in the Golden Point gutter workings, but the work was found to be unprofitable. In 1866, the claim became the property of the Lady Don Company.

The only recorded yield of the Spes Bona Company was 661 oz. in 1865.

### SIR WILLIAM DON COMPANY.

The ground held by this company was taken up by a number of the working shareholders in the Hand in Hand Company in 1861, and an adjoining block, including the cricket ground (Western Oval), was secured in 1863. The Hand in Hand Company transferred its shaft, together with portion of its claim, to the Sir William Don Company. A level was opened up at 250 feet in this shaft, and rich washdirt was located from this level at 280 feet north of the shaft, and at a depth of 210 feet from the surface. The run of rich washdirt, which was 500 feet wide, was spread over a number of terraces, each carrying the same thickness of wash. In the north-eastern portion of the mine the terraces rose to within 170 feet of the surface, or 150 feet above the level of the adjacent Inkerman lead. From the 11th November, 1865, to 18th May, 1867, the gold yield was 38,034 oz. of gold, valued at £153,355, and the

dividends for this period amounted to £99,000. The total calls to this date amounted to £2,000.

The discovery of this rich ground gave an impetus to mining, and many new companies were formed to prospect in the neighbourhood. The quarterly output from the mine averaged a little over 100,000 trucks of washdirt.

In February, 1866, a trial crushing of 15 tons of quartz from a reef 9 feet thick yielded 10½ dwt. per ton. This reef trended north towards the Great Republic claim, which was, therefore, bought by the Sir William Don Company. In November, 1867, 40 tons of quartz taken from the reef near the shaft at 50 feet below the previous sample yielded 6 dwt. of gold per ton.

A large bed of cement was found 200 feet north of the Cricket Reserve. This was 50 feet wide, and yielded 7½ dwt. per ton when crushed.

Encouraged by the prospects from the cement and the quartz reef, the company, early in 1868, installed a 10-head battery. The first crushing of 120 tons of quartz returned 43 oz. 17 dwt. Before operations ceased in October, 1868, 200 feet of the lode had been stoped to an average height of 30 feet. The formation was found to be a flat vein, which became narrower as it was followed, and it was decided that to test the lode in the shaft would involve too much expense. The vein dipped (pitched) south 25 feet in 200 feet, and had an underlie east 7 feet in 30 feet. It was mined at a trifling cost, but could be considered payable only when worked in conjunction with other formations.

A run of reefwash was found from the lower reef drive, and blocked out, in 1868. In October, 1868, all the payable ground had been taken out, and the company was wound up. The total value of the gold won was £240,512. Dividends amounted to £131,000, and wages to £60,885. The returns for the last two quarters, £14,416 19s. 9d. and £16,002 respectively, merely paid expenses, no dividends being declared after 12th November, 1867.

### SOUTHERN CROSS COMPANY.

This company, in 1860, held a block claim of 8 acres, covering an area reserved as a camping ground for the Survey Department. Two adjacent freeholds were rented, and permission was granted to mine under Lake Wendouree, but this concession was afterwards revoked. The main shaft was sunk to a depth of 356 feet, and passed through:—

| Formation. | Thickness. feet. |
|---|---|
| Surface clay .. .. | 5 |
| Basalt (first rock) .. .. | 160 |
| Clay .. .. .. | 12 |
| Basalt (second rock) .. | 39 |
| Clay and wash .. .. | 1 |

The shaft bottomed at 217 feet, and the main level was opened out at 350 feet. After driving north-easterly for a distance of 325 feet, the Inkerman gutter was reached by a rise of 16 feet, the depth of the gutter at this point being 327 feet below the surface. The gutter was prospected for a distance of over 300 feet, and was proved to be 50 feet to 70 feet wide. The washdirt, which was from 2 ft. to 3 ft. thick, was poor. A drive was put in north-easterly for 300 feet, and a rise at this distance located the National lead, which was also poor. The company was then wound up, and the mine became the property of the Victoria Company in June, 1864.

Between October, 1859, and June, 1864, the amount of capital called up was £21,629, and the value of gold won was £2,765.



### SOUTHERN FREEHOLD COMPANY.

This company, formed in October, 1866, held an area of about 8 acres of freehold property east of the Park, and north of the Ballarat Freehold Company's claim. The shaft passed through:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (first rock) .. .. | 132 |
| Stiff brown clay .. .. | 40 |
| Basalt (second rock) .. | 22 |
| Sandy clay and drift .. | 35 |
| Washdirt .. .. | 2 |

To cope with the water at 215 feet, pumps were put in. The shaft bottomed at 231 feet on a soft slate bottom, dipping north-easterly. Shaft sinking began on 8th October, 1866, and the bottom was reached in February, 1867. Sinking in the bedrock was continued to 252 feet, where the main level was opened. Early in April, this drive was in 500 feet, and the mine was gold producing. In June, 1867, the claim of the Great Western Company was purchased. In October, 1867, the Southern Freehold amalgamated with other companies to form the Park Company.

The total output from the mine to this date was 9,546 oz.; dividends, £10,425; and called-up capital, £3,750.

### ST. GEORGE COMPANY.

The St. George Company, which was formed in 1861, registered for 2,379 feet along the Woolshed lead. A shaft was sunk to a depth of 276 feet, and a drive was put in 635 feet south-westerly to the Woolshed gutter. The gutter dipped so rapidly that it became necessary to sink a new shaft about 2,000 feet to the south-west of the first shaft.

In September, 1863, the St. George and several adjacent claims—the Hercules, the Potomac, the Victory, and the J. P. Fawkner—amalgamated to form the St. George United Company. In 1864 the Trafalgar Company (formerly known as the Unicorn), on the Bull's Run lead, was also incorporated with the new company, and five block claims were added during the year. The claim now extended from the Red Jacket to the Great Extended and westward to the Albion.

When operations were suspended at the St. George shaft, the gutter in the lowest part was 293 feet below the surface. The second shaft was situated on a direct line between the old shaft and the Albion Company's shaft. It bottomed in July, 1865, at a depth of 378 ft. 6 in. on 3 ft. 6 in. of washdirt, and the washdirt from the bottom yielded 12 oz. 10 dwt. of gold. Up to the time of bottoming the shaft, the expenditure was £16,402. By February, 1866, the gold yield was 3,212 oz., sold for £13,018. On driving westward the workings of the Albion Company were met with. The gutter at this point was 230 ft. wide. North-east of the shaft rich ground was worked. North-west of the shaft, high reef only was found. During 1866, nearly 1,000 trucks of wash-dirt was raised every day on the average. In 1867, a layer of cemented wash, which yielded from 1 dwt. to 1 oz. to the nail-can, was proved for 100 ft. in width.

In November, 1868, the company united with portion of the United Extended Band of Hope Company to form the St. George and Band of Hope United Company.

Up to the date of amalgamation the St. George United Company had won 38,595 oz. 10 dwt. 4 gr. of gold.

### ST. GEORGE AND BAND OF HOPE UNITED COMPANY.

The St. George and Band of Hope United Company had good yields, and paid large dividends from the first. By the end of 1868 (three months after its formation), the company had won 6,880 oz. of gold, and paid over £6,000 in dividends. Early in 1869, the claim and plant of the Guiding Star Company were purchased for a sum of £1,100, and operations were extended on the north side of the Smythesdale road. Several quartz reefs from 3 ft. to 12 ft. wide were passed through in the drives at this time. The Guiding Star shaft formed No. 3 shaft of the company, from which the eastern side of the Golden Point lead from the Redan Company southwards was explored in the search for reef-washes.

By the end of 1869, the United Company employed about 380 men in their claim (250 acres), which was worked from four shafts. No. 1 was the original St. George Company's shaft; No. 2 was sunk by the St. George United Company; No. 3 was purchased from the Guiding Star Company; and No. 4 was purchased from the Red Jacket Company. In July, 1869, £3,000 was paid in dividends, but for the remainder of the year the returns were poor.

A considerable amount of driving (3,950 feet) was carried out from No. 3 shaft in 1870, and some good ground found in April was worked throughout the year. The output for 1870 was 11,029 oz. At No. 2 shaft, nothing payable was located, and No. 4 shaft was re-opened for a short period.

In 1871, No. 2 and 3 shafts were let on tribute, and a large area of payable ground eastwards from No. 3 shaft was opened up. The gold yield was 5,161 oz. for the year. In 1872, prospecting drives from Nos. 2 and 3 shafts were put in. The old Golden Point gutter was re-worked from No. 3 shaft, and yielded fair returns. Much dead work was carried on towards the end of the year. The yield for 1872 was 5,205 oz.

Early in 1873, lack of funds hampered operations, and a new company was formed to take over the mine in August, 1873. The new company (the St. George) failed to win any gold until 1875, when a new era of prosperity began. Three years of fairly successful work followed, and then the claim and plant were sold to the Guiding Star Company, whose sole object was to work the line of reef which had been passed through in the alluvial. The following is the list of recorded yields:—

ST. GEORGE UNITED COMPANY.

| Year. | Gold Yield. | | |
|---|---|---|---|
| | oz. | dwt. | gr. |
| 1865 | 3,436 | 4 | 0 |
| 1866 | 17,312 | 2 | 12 |
| 1867 | 9,298 | 18 | 12 |
| 1868 | 15,428 | 5 | 4 |

ST. GEORGE AND BAND OF HOPE UNITED COMPANY.

| Year. | Gold Yield. | | |
|---|---|---|---|
| | oz. | dwt. | gr. |
| 1869 | 12,020 | 3 | 6 |
| 1870 | 10,859 | 2 | 0 |
| 1871 | 7,064 | 1 | 12 |
| 1872 | 3,341 | 16 | 12 |
| 1873 | 315 | 10 | 0 |

ST. GEORGE COMPANY.

| Year. | Gold Yield. | | |
|---|---|---|---|
| | oz. | dwt. | gr. |
| 1875 | 2,012 | 2 | 4 |
| 1876 | 1,745 | 0 | 23 |
| 1877 | 735 | 15 | 18 |

### TANNERY COMPANY.

This company was formed in 1858 to work a block of ground on the south side of Sturt-street and to the east of the park. The shaft was sunk to a depth of 410 feet, the strata passed through being:—

| Formation. | Thickness. feet. |
|---|---|
| Loam and clay | 10 |
| Basalt (first rock) | 165 |
| Clays | 17 |

Much water was encountered in the basalt, but this was puddled back, and the shaft was sunk 218 feet in the bedrock under comparatively dry conditions. In 1860 the necessary depth having been reached, driving for the supposed course of the Inkerman lead was started, but several months of fruitless search failed to locate deep ground, and work ceased in February. In May, 1861, some of the party re-organized under the title of the Copenhagen Company. The Copenhagen Company, led by a clairvoyant, spent some six months in driving and boring for the deep ground, but was as unsuccessful as the original company, and gave up about the end of 1861. The property was later on secured by the Inkerman and Durham Junction Company in 1866.

### UNION COMPANY.

The Union Company, on the Inkerman lead, was formed by the amalgamation of the Montezuma and Unicorn companies in October, 1858. Prior to this the two parties had worked portion of the lead and trouble had arisen as to their boundaries. The lead was proved from 60 ft. to 70 ft. in width, with washdirt 3 ft. to 4 ft. in thickness, yielding from 10 oz. to 28 oz. to the machine. The average dividend ranged from £7 to £8 per man per week. There were seventy-five shareholders.

### UNITED HAND IN HAND AND BAND OF HOPE COMPANY.

This company was formed in September, 1866, by the amalgamation of that portion of the Band of Hope Company's claim lying within the public park and the portion of the Hand in Hand Company's claim in the vicinity of No. 2 shaft. The original Band of Hope Company's No. 1 shaft became the No. 1 shaft of the new company, and the Hand in Hand Company's No. 2 shaft became the No. 2 shaft of the new company. The sinking of a third shaft was started in October, 1866, the site being to the north of Nos. 1 and 2 shafts, and near the eastern side of the public park, within the company's block claim purchased from the Victoria Company. At No. 1 shaft a large pumping plant was installed, and the operations at this shaft were chiefly confined to pumping. At No. 2 shaft a large area of wash-dirt, partly opened up by the Hand in Hand Company, was worked. No. 3 shaft was bottomed in 1867 after passing through:—

| Formation. | Thickness. feet. |
|---|---|
| Basalt (first rock) | 125 |
| Clay | 35 |
| Basalt (second rock) | 48 |

It was sunk to 250 feet, and at that depth drives were put in, and good wash was located in 1867, at 237 feet from the surface; a layer of reef-wash 6 feet thick was opened up. In November, 1867, this shaft, together with portion of the claim, was transferred to the Park Company. (See p. 92.)

In November, 1866, No. 4 shaft, situated south-west of the park, was commenced; the sinking

was slow owing to a heavy drift at a depth of 242 feet. A pumping plant was erected in 1869. In June, 1869, all work, except pumping, ceased at No. 1 shaft, and the yields of the company stopped until 1870. No. 2 shaft was opened out at a depth of 350 feet, and, early in 1870, a drive north-west broke through into a mixture of clay and sand at 400 feet from the shaft; this was too shallow for the gutter. To test the ground east and south-east, two drives were put in, and at 200 feet from the shaft, bores put up 80 feet above the level broke through in both cases. A drive north-east broke through at 600 feet from the shaft into wash which gave payable prospects. The shaft was then deepened to 450 feet, and at 426 feet from the surface a drive was opened out north-westerly for 455 feet by July, 1870. A balance-shaft was put up 58 feet at 270 feet from the shaft and wash-dirt was opened up. By the end of 1870 the company began to pay dividends again. An extensive wash, nearly 900 ft. in width from north to south, was opened up, and the greater part proved to be payable. During 1871 the main wash-dirt drives were extended westerly from the shaft, proving large areas of payable ground. Another shaft (No. 5) was cleaned out, and a reef-drive was put in south-westerly for a distance of 480 feet, where a rise was put up 42 feet. A drive south for 110 feet failed to prove anything payable, and work at this shaft was discontinued.

In 1872 the east and west drives, 1,450 feet from No. 2 balance-shaft, had proved wash over 400 ft. wide, but poor in quality. A connexion was made to the Inkerman and Durham gutter, and a drive put in along this gutter for 600 feet reached to within 120 feet of where the Inkerman and Durham Company ceased working. This lead was 120 ft. wide where tested. The main shaft, which was considered to be too shallow, was sunk to 495 feet during the year, and a main westerly level was opened at that depth. A return to No. 2 shaft was made, and a level was opened out at 243 feet from the surface, where a south-easterly drive met falling ground in that direction.

In 1873 work at the 315-ft. level was resumed at No. 2 shaft, and a main level was driven while old drives were repaired. Prospecting drives failed to locate payable wash, and this shaft was abandoned early in 1874. At a depth of 500 feet in No. 4 shaft a drive was put in west to test the gutter which had already been found to dip underfoot at 1,150 feet west of the shaft at the 425-ft. level. The 500-ft. cross-cut passed through very hard sandstone. While this cross-cut was being driven a blind shaft was sunk sufficiently deep below the 425-ft. level to connect with the 500-ft. level, and from this drives were started east and west. The blind shaft drive and the main level were connected in 1874, the total distance from the main shaft to the west face of the 500-ft. level (driven partly from the blind shaft) being 1,525 feet. By the end of 1874 the main level had reached 1,982 feet from the shaft. At 1,630 feet from the shaft a bore broke through into wash at 64 feet above the drive. A jump-up was risen at 1,700 feet from the shaft, and from this a south drive was opened out in the bedrock at 45 feet; bores from this drive, however, proved that it had crossed the gutter, and a westerly drive down the gutter was therefore put in for a distance of 45 feet. A bore in the face of the main level broke into wash at 70 feet above the back of the drive.

In 1875 a bank foreclosed on the mine and sold the property privately. Legal proceedings, arising out of this action, continued for a number of years. In 1877 the company obtained a verdict, against which the bank appealed. The mine was then sold to the Park Extended Company, which did but little work. It was not until 1881 that the litigation with the bank ceased, the company receiving £3,000 in settlement of the case. Legal quibbles over other matters lasted until 1883, but no work below was carried on after 1875.

### UNITED WORKING MINERS' COMPANY.

The Working Miners' Company, which was registered for claims Nos. 83 to 98 on the Frenchman's lead, began shaft sinking in June, 1856. After an amalgamation of areas in November, 1858, the United Working Miners' Company was formed. In December, 1858, this company began to sink a shaft 8 ft. by 4 ft. in the clear, and erected two engines, one for winding and the other for pumping. Two pumps, 14⅛ inches and 15½ inches in diameter respectively, were installed. The strata passed through consisted of:—

| Formation. | Thickness. feet. |
|---|---|
| Surface earth and clay | 5 |
| Basalt (first rock) | 75 |
| Clay | 7 |
| Basalt (second rock) | 108 |
| Broken rock | 3 |
| Basalt (thrd rock) | 78 |
| Black clay | 14 |
| Drift | 5 |
| Basalt (fourth rock) | 77 |
| Drift | 2½ |
| Clay | 5 |
| Drift and washdirt | 12½ |

The shaft bottomed at 392 feet on 1st November, 1861.

In the third rock from 600 to 660 gallons of water per minute had to be dealt with until the shaft was puddled up.

The main level was opened out at a depth of 412 feet, but later on the shaft was deepened and another level was opened in a southerly direction at 470 feet from the surface. Prior to the bottoming of their shaft the party expended £13,571, exclusive of the labour of shareholders. Opening out south-westerly the main drive broke through into washdirt about 2 ft. thick, which proved to be very poor. A drive was also put in easterly to meet the supposed continuation of the Frenchman's lead.

Gold was first obtained in November, 1862, and the output to the end of the year was 103 oz., valued at £411; expenditure to this date was £15,808, and the outstanding liabilities £6,639. During 1863 the small lead west of the shaft was followed, the washdirt averaging 4 ft. in thickness. This lead rose to the north, and averaged 150 feet in width, but was poor. In November, 1863, the company re-organized under Pyke's Limited Liability Act with a capital of £90,000, each original share being divided into twenty in the new company. During 1864 no richer washdirt was found, and none was treated in the second half of the year; the chief work then in progress was a southern drive to intercept the Frenchman's lead or its continuation after its junction with the Nelson and Wellington leads. In December, 1864, the company was re-registered under Mason's Act with a share register of 4,800. In 1865 a drive was put in northerly towards the Albion Company's mine to work the wash on which that company was engaged. Towards the end of 1865 puddling machines were erected: prior to this the company had merely sluiced off

its washdirt. A western drive put in by order of the Court of Mines proved that no outlet of the Frenchman's lead lay in that direction.

In September, 1866, the south drive at the 470-ft. level intersected the Frenchman's gutter at a distance of over 2,000 feet from the main shaft. Surveys proved that the Frenchman's lead had entered and left the Nelson Company's ground on that company's eastern boundary, and that the Defiance Company had worked 100 feet of the lead which belonged to the United Working Miners' Company. The reef-wash and workings south-westerly and westerly from the shaft were regarded as merely the sweep from the bend taken by the Frenchman's lead and tributaries when changing their courses. The lead in the south drive was 150 ft. wide, and carried 18 inches of washdirt; from 2 feet to 3 feet of the soft bed rock was taken out with the wash for treatment. Payable returns were being obtained by the end of 1866, and small dividends paid.

In 1867 a second shaft was sunk, and from the workings at this shaft gold was obtained in April, 1868. The workings on the main lead were now (1868) over 2,700 feet in rich washdirt, and regular dividends were paid. Early in 1869 a run of reef-wash was discovered 180 feet above the level of the main gutter; this wash averaged 10oz. to the machine and, though discovered from No. 1 shaft, was worked from No. 2 shaft. The receipts for the first quarter of 1869 were £3,409, a marked decrease from those for the preceding quarter (£10,483). Prospecting operations in the gutter (Golden Point!) south of the shaft were continued, and good results obtained. In the eastern bend of the lead the wash was very poor. The wash north-east of No. 2 shaft proved to be extensive but poor, and was let on tribute in July, 1869; a connexion was made between Nos. 1 and 2 shafts without proving any of better quality. The connecting drive, which was 240 feet below the surface, started with basalt in the roof, but the bedrock rose at the rate of 25 feet in the 100 feet until it was 45 feet over the back. Bores put up broke through into sandy washdirt. A quartz reef, supposed to be the continuation of the Prince of Wales lode, was tried, but the results were not recorded.

For the quarter ending October, 1869, the receipts were £16,561 4s. 10d., and the outlay £17,804. Small yields were obtained from prospecting works until 1873, when the mine closed down, after some years' unprofitable work. The following yields were obtained:—

| Year. | Gold Yield. | Dividends. |
|---|---|---|
| | oz. dwt. gr. | £ |
| 1862 .. .. .. | 103 6 12 | .. |
| 1863 .. .. .. | 1,847 0 0 | .. |
| 1864 .. .. .. | 580 0 0 | .. |
| 1865 .. .. .. | 811 16 6 | .. |
| 1866 .. .. .. | 4,287 19 0 | 2,400 |
| 1867 .. .. .. | 19,677 1 18 | 28,800 |
| 1868 .. .. .. | 22,032 4 6 | 31,200 |
| 1869 .. .. .. | 7,609 9 0 | .. |
| 1870 .. .. .. | 3,089 15 12 | .. |
| 1871 .. .. .. | 2,010 11 3 | .. |
| 1872 .. .. .. | 1,843 9 0 | .. |
| 1873 .. .. .. | 1,677 15 0 | .. |

VICTORIA COMPANY.

The ground held by this company formerly belonged to the Southern Cross Company (see p. 97) whose shafts and drives were utilized. Starting in June, 1864, the drives on the Inkerman lead were extended. In October, 1865, the wash improved in value, and yielded 6 oz. to 12 oz. to the machine. By the end of 1865, the weekly yield was 25 oz. The improved yields were ascribed to a small quartz reef which crossed the course of the gutter. Later, a large quartz reef was met with which yielded a good prospect of gold when first struck. At 80 feet west of this reef the gutter was nearly level, and carried a great thickness of washdirt from 160 feet to 200 feet in width. The gutter, at the point where it was worked furthest downstream, was about 370 feet below the surface. The reef-wash passed through in the shaft was prospected without success, and work in the gutter was unprofitable, and the mine was therefore closed down in September, 1866. The amount paid in calls by the shareholders was £13,371, and the gold yield was valued at £2,355. The Hand in Hand Company secured the ground after work ceased, but nothing further was done from this shaft.

VICTORIA CEMENT COMPANY.

The Victoria Cement Company, in 1859, had a crushing plant at the foot of Golden Point near the Red Hill lead. This company mined the gutters and crushed the cement, some of which was rich, and yielded nuggets up to 30 lb. in weight. A cutting 50 feet deep was opened for sluicing the alluvium, the cement being put aside for crushing. The gold yield averaged 1 dwt. to the load, and 100 loads a day were treated, yielding the twenty shareholders £6 per week per man, less working costs.

WESTERN FREEHOLD COMPANY.

This company was formed in April, 1866, to work a block of 20 acres of private property eastwards from the Public Park. The shaft was sunk 270 feet, passing through:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| Basalt (first rock) .. .. | 146 |
| Clay .. .. .. .. | 23 |
| Drift, clay, and gravel .. .. | 60 |

It bottomed at 229 feet, and was sunk to 300 feet.

The shaft was started on 7th of May, 1866, and the washdirt was reached by rises above the 270-ft. level. Gold was first recovered on 11th March, 1867. The wash extended over 11 acres; it was about 400 ft. in width and averaged 7 ft. in thickness. The company was wound up in June, 1868; the total gold produced was 26,864 oz., valued at £108,528; dividends, £53,250; calls, £5,625.

WEBSTER-STREET COMPANIES.

Towards the end of 1867, and early in 1868, the success of the Great Northern Freehold Company, working the reef-wash adjacent to the old Inkerman gutter, caused a rush to this locality. Many companies were formed with little prospect of success, but others were more fortunate. The most conspicuous was the Webster-street Freehold Company which sank its shaft in 1868, erected the necessary machinery, and worked out its ground within five months; during that period it won 8,156 oz. of gold, and paid dividends of £4 18s. per share (£17,100 in all) against £1 per share called up.

The Great Webster, East Webster, Webster Extended, and Yuille-street Freehold Companies were at work during 1868, but of these the Great Webster alone was successful; its gold yield was 589 oz. 8 dwt. for the quarter ending June, 1868.

## THE NUGGETS.

A feature that contributed largely to making the Ballarat field historically important from the earliest digging days, was the discovery of nuggets or masses of almost pure gold of remarkable size and value.

There can be little doubt that these nuggets originated in quartz reefs. "Slugs" or masses of gold of considerable size have been obtained from quartz reefs in the deeper workings (see p. 104), and their abundance compared with the recorded nuggets is remarkable when it is borne in mind that the mines have penetrated only a minute portion of the bedrock, and that the detrital deposits in which the nuggets have been found are the concentrates from a volume of denuded rock, the extent of which cannot even be guessed at. In the case of one vein in the Woah Hawp Canton and the North Woah Hawp mines (see Pls. 26 & 28), ten "specimens" were there taken at one level from a portion of the reef 400 feet long, while above and below, within a distance of 100 feet, twenty-two other masses of gold were obtained.

The nuggets, with a few exceptions, were distributed along three well-defined belts or zones. These belts, taken in order from west to east, conform to the central portion of the Ballarat West reef belt, the Ballarat East reef belt, and the western edge of the Little Bendigo field.

In the Ballarat West belt, between the Prince of Wales mine, to the south, and the Kohinoor, Cosmopolitan and Lady Don mines further north, nuggets of 216 oz., 144 oz., 320 oz., 834 oz., 110 oz., and 606 oz. were found, besides some scores of smaller ones. In the Kohinoor and the Cosmopolitan mines the large nuggets were found in the main gutter, but the other large nuggets were met with in the reef-wash 20 feet to 150 feet above the deep ground. Describing the position of the 834-oz. nugget, Mr. Woolridge, the manager of the mine, stated[1] that the mine "had an incline down into the gutter, and a pump at the bottom of the incline, lifting the water a height of 30 feet, so that it could run back to the shaft Close to the pump we had left two little corners of solid ground stand, until finishing with this part of the gutter, when we started to take them out. There was a large boulder or slab of quartz in one of these corners rather lower than the bed of the gutter, for it formed part of a hole in the cap of a rubbly quartz lode (now called the Guiding Star line of reef). On turning this slab of quartz back we found the gold adhering to it in one solid lump—834 oz. of gold—on the other side, which separated clean from it with a few blows of a pick. I do not know if any gold showed in the slab of stone, for we never bothered about it. We took out in that spot about two sets of ground (48 square feet), and made up our total yield with this nugget to 1,800 oz. Not much more than 100 feet from the same place in the gutter, and in a little deep bend or recess, we obtained during one fortnight 42 nuggets of various weights, but the smallest weighed over 40 oz. The gutter was narrow, not more than 60 to 80 feet wide, but it contained a little island of high reef-wash where the gold lay on the bedrock thickly. The place where the 834-oz. nugget was found is on the west side of Ascot-street. The No. 1 Kohinoor mine drove for a considerable distance on the east side of the street along the Guiding Star line of reef without obtaining a colour of gold."

The Lady Don nugget, 606 oz., was found at a height of 60 feet above the gutter, near the south-eastern corner of Sturt and Drummond streets.[1] The mine manager of the Lady Don mine, in describing the location of the Lady Don nugget, stated that this nugget was overlain by, and, to some extent embedded in, the lava sheet, showing that it had long lain exposed while the surrounding drift had formed the beginnings of a channel or run of extremely rich wash in the adjacent Sir William Don mine.

The Prince of Wales nugget, 216 oz., of which 180 oz. was gold, was found in the reef-wash nearly 100 feet above the level of the main gutter.

The above nuggets, as well as those found in the Cosmopolitan mine, and in the St. George mine, on the Green Hill lead, were in close proximity to the black slate zone of country.

The Ballarat East nuggets are more closely connected with the zone of strata favorable to auriferous reefs, and, with the exception of the Welcome, the largest were found in Canadian Gully, near the Indicator line of country. The Welcome nugget was found in the same zone of strata on the Sulieman line, a parallel fold to the west. The discoverer of the Welcome nugget, Mr. Wm. Roberts, stated that,[1] "with a party of 22 mates they took up a claim on the 'old ground' of the Bakery Hill lead, where the lead had been worked over at least twice previously. On account of its being classed officially as 'old ground,' the party obtained a rather long strip, reaching from a point where the Earl of Zetland hotel now stands in Bridge-street, back to Bakery Hill. Not finding much gold left in the heart of the lead they tried the higher terraces and found this nugget (the Welcome) lying on a steep siding, and almost toppling over into the gutter."

From the Canadian Gully three nuggets, weighing 1,011 oz. 15 dwt., 1,117 oz. 11 dwt., and 1619 oz., were found within a few feet of each other in one claim, and it is recorded that smaller pieces totalling 2,640 oz. were taken from the same small claim. The 1,011 oz. 15 dwt., and the 1,117 oz. 11 dwt. were within 10 feet of the 1,619-oz. nugget. Two smaller nuggets, 368 oz. and 143 oz., were found within 30 feet. The 1,619-oz. nugget had 300 oz. of quartz associated with it; the 1,117-oz. nugget 400 oz. of quartz, and the other two about 250 oz. conjointly.

[1] F. D. Johnson, manuscript report.

[1] F. D. Johnson, manuscript report, 1906.

## NUGGETS FROM THE BALLARAT GOLD-FIELD.

| No. | Date. | Weight. | Locality. | Remarks. |
|---|---|---|---|---|
| | | oz. dwt. | | |
| 1 | 15th June, 1858 | 2,217 16 | Bakery Hill .. | The Welcome nugget. Found by a party of 24 men at a depth of 180 feet; apparently waterworn and irregular in shape, length 20 inches, breadth 12 inches, depth 7 inches; contained about 10 lb. of clay, quartz, and oxide of iron. It was first sold in Ballarat in 1858 for £10,500, and again in Melbourne on the 18th March, 1859; when weighed 2,195 oz., and realized £9,325, or £4 4s. 11d. per oz. It was melted in London in November, 1859. Assay, 99·20 % gold |
| 2 | 31st January, 1853 | 1,619 0 | Canadian Gully .. | The Sarah Sands nugget. Found by a party of four men at a depth of 60 feet, and immediately afterwards they found a smaller one weighing 76 oz. Two of the party had been in the colony not longer than three months, when they returned to England with their prize in the steamer *Sarah Sands*. The specimen, though large, was not very attractive, for both the gold and the quartz were dark coloured. Melted in London in 1853. Weight before smelting 1,615 oz. 10 dwt., after smelting 1,319 oz. 1 dwt. 12 gr. of fine gold. Assay, 98·96 % pure gold—equal to 1,423 oz. standard gold. Valued at £3 17s. 9d., £5,532 7s. 4d., the loss in weight in smelting being 296 oz. 8½ dwt., or 18.6 % |
| 3 | 8th September, 1854 | 1,177 17 | Near Canadian Gully | The Lady Hotham nugget. Found at a depth of 135 feet. It contained much quartz and sulphide of iron, but was a fine specimen. From the same hole there were obtained upwards of 2,640 oz. in smaller nuggets. The value of gold therefore from this claim was not less than £13,000. The specific gravity was 6·093, and the estimated weight of pure gold 755 oz. |
| 4 | 20th January, 1853 | 1,117 11 | Canadian Gully .. | Found by a party of three men in a drive at a depth of 60 feet amongst quartz boulders and washing stuff containing an ounce of gold to the tub. It was 20 inches long, 8½ inches wide, and 5 inches thick. The first blow of the pick led the miner to suspect it had struck gold, with the second blow the pick struck the mass. The gold was finely intersected with quartz |
| 5 | 22nd January, 1853 | 1,011 15 | Canadian Gully .. | This mass was found two days after the above in the same claim and tunnel, and within 10 feet of the one found on 31st January, 1853. It was 12 inches long, 6 inches wide, and 6½ inches thick, shaped somewhat like a pyramid. This was a very fine specimen, consisting of much gold with remarkably white quartz. The two working miners continued at work only a fortnight when they found about 100 oz. of small gold. They sold their claim for £84 |
| 6 | 27th July, 1860 | 834 0 | Kohinoor Company | Found in the gutter at 400 feet from the surface and nearly 1 mile from the head of the lead. It measured about 14 inches in length and nearly 24 inches in girth; resembled a leg of mutton in shape, and was remarkably free from dirt or quartz. Sold to the Bank of Australasia for £3,336 |
| 7 | 7th February, 1854 | 625 0 | Eureka .. | Found in an alluvial hole, smooth and nearly free of quartz. It was 9 inches long by 7 inches broad |
| 8 | 23rd August, 1887 | 617 0 | Midas Mine .. | The Lady Loch nugget. Found at 114 feet deep |
| 9 | 9th November, 1866 | 606 0 | Lady Don Mine .. | The Prince of Wales nugget. Found 60 feet above the gutter in a run of auriferous ground 80 feet wide |
| 10 | 6th March, 1855 | 571 0 | Bakery Hill .. | Found at a depth of 185 feet. This nugget and the Welcome nugget (No. 1 on list) were found within 150 yards of each other |
| 11 | November, 1857 | 540 0 | Native Youth .. | Found at a depth of 9 feet by Osbaldiston, French and party, and was disposed of by a lottery on the principle of the art union; there were 2,600 tickets at £1 each |
| 12 | March, 1855 .. | 480 0 | Bakery Hill .. | A lump of solid gold |
| 13 | .. .. | 408 0 | "The Twisted Gum Tree" | |
| 14 | 1853 .. | 371 21 | Canadian Gully .. | Contained a good deal of quartz. Was sold in Melbourne in March, 1853, for £1,465 16s. 11d.—equals £3 19s. per ounce |
| 15 | February, 1853 | 368 0 | Canadian Gully .. | Found by two diggers at a depth of 60 feet, about 30 feet from No. 2 nugget (1,619 oz.) |
| 16 | 14th March, 1862 | 320 0 | Kohinoor Mine .. | The Sir Dominick Daly nugget, named in honour of the Governor of South Australia, who visited the company's mine. The nugget was irregular in shape, presenting the rude outline of a vase to the fanciful eye, while a ring-like portion of the lump enabled the jovial bearers of the prize to carry it as a tailor's "goose" might be carried |
| 17 | 19th December, 1862 | 229 0 | Eureka .. | Found by a party of eight men; a lump of almost pure gold, value £835 6s. |
| 18 | November, 1865 | 216 16 | Prince of Wales Mine | Supposed to contain 180 oz. of gold |
| 19 | 26th March, 1858 | 168 0 | Napoleon lead .. | Found at a depth of 160 feet |
| 20 | 4th June, 1887 | 167 5 | Midas Mine, Sulky Gully | The Lady Brassey nugget. Found at a depth of 114 feet |
| 21 | 1874 .. | 144 0 | Prince of Wales Mine | |
| 22 | February, 1853 | 143 15 | Canadian Gully .. | Found about 30 feet away from No. 2 nugget (1,619 oz.) |
| 23 | 24th April, 1861 | 132 0 | Great Extended Mine | |
| 24 | 29th November, 1862 | 128 10 | Great Extended Mine | |
| 25 | 1st February, 1866 | 115 0 | Sons of Freedom Mine | |

NUGGETS FROM THE BALLARAT GOLD-FIELD—*continued.*

| No. | Date. | Weight. | Locality. | Remarks. |
|---|---|---|---|---|
| | | oz. dwt. | | |
| 26 | .. .. | 114 0 | Bakery Hill | |
| 27 | 2nd February, 1866 | 112 2 | Sons of Freedom Mine | |
| 28 | 24th April, 1874 | 112 0 | Leviathan Mine .. | Found at a depth of 195 feet |
| 29 | 14th January, 1864 | 110 15 | Cosmopolitan Mine | The largest yet found in the claim |
| 30 | 25th May, 1869 | 108 0 | Kohinoor Mine | |
| 31 | .. .. | 108 0 | No. 1 shaft, Prince of Wales Mine | |
| 32 | 1910 .. | 107 0 | Ashe's lead .. | Found at a depth of 10 feet by David Bernard |
| 33 | 1853 .. | 100 0 | Sailor's Gully .. | Found by Vallins at a depth of 107 feet, then the deepest shaft in Ballarat |

THE FOLLOWING LIST GIVES THE SMALLER NUGGETS RECORDED BY THE SEVERAL COMPANIES WITHIN A RADIUS OF 8 MILES FROM THE POST OFFICE, BALLARAT :—

| Date. | Weight. | Remarks. |
|---|---|---|
| *Cosmopolitan Company.* | | |
| | oz. dwt. | |
| June, 1863 .. .. | 98 7 | These nuggets were all in the vicinity of the Kohinoor nugget. |
| September, 1862 .. | 44 0 | |
| ,, .. | 40 0 | |
| ,, .. | 32 0 | |
| ,, .. | 31 0 | |
| ,, .. | 12 11 | |
| ,, .. | 9 0 | |
| ,, .. | 8 0 | |
| ,, .. | 6 0 | |
| 23rd June, 1864 .. | 51 0 | |
| 6th October, 1864 .. | 20 0 | |
| 3rd October, 1864 .. | 7 0 | |
| *Great Extended Company.* | | |
| 29th November, 1862 .. | 48 0 | |
| March, 1863 .. .. | 34 0 | |
| 29th November, 1862 .. | 19 0 | |
| ,, ,, .. | 16 0 | |
| *Sons of Freedom Company.* | | |
| February, 1865 .. .. | 68 0 | |
| 11th February, 1865 .. | 50 0 | |
| 11th January, 1866 .. | 30 0 | 2 nuggets aggregating 30 oz. |
| 14th January, 1865 .. | 8 0 | |
| *United Albion and Prince of Wales Company.* | | |
| 13th December, 1869 .. | 35 0 | |
| *Waterloo Company.* | | |
| 16th June, 1866 .. | 62 4 | |
| 10th June, 1865 .. | 84 0 | Several nuggets |
| 8th October, 1864 .. | 66 0 | Several nuggets |
| 6th May, 1864 .. | 25 0 | |
| 10th May, 1864 .. | 23 15 | |
| 6th September, 1865 .. | 20 0 | |
| 31st July, 1864 .. | 6 10 | |
| *Great Gulf Company.* | | |
| 8th August, 1867 .. | 96 2 | |
| 25th June, 1869 .. | 27 8 | |
| 29th April, 1869 .. | 21 5 | |
| 9th September, 1865 .. | 12 0 | |
| 11th July, 1868 .. | 21 0 | |
| *Ballarat Freehold Company.* | | |
| 4th June, 1867 .. .. | 71 0 | From No. 2 shaft workings |
| 9th September, 1867 .. | 23 0 | |

| Date. | Weight. | Remarks. |
|---|---|---|
| *Ballarat Extension Company.* | | |
| | oz. dwt. | |
| 11th June, 1867 .. | 85 0 | |
| 29th March, 1867 .. | 22 15 | |
| 29th March, 1866 .. | 22 0 | |
| 15th June, 1867 .. | 18 0 | |
| 21st January, 1866 .. | 17 0 | |
| *Prince of Wales Company.* | | |
| 17th February, 1868 .. | 20 0 | |
| 5th December, .. .. | 17 12 | |
| 18th December, 1863 .. | 9 0 | |
| May, 1863 .. .. | 7 0 | |
| *Scottish and Cornish Company.* | | |
| 14th September, 1864 .. | 60 0 | |
| 20th September, 1864 .. | 40 0 | |
| 1st October, 1864 .. | 20 0 | |
| 13th July, 1867 .. | 18 12 | |
| 26th December, 1868 .. | 10 10 | |
| 9th April, 1867 .. .. | 10 0 | |
| 11th January, 1869 .. | 9 10 | |
| *Band of Hope Company.* | | |
| 4th January, 1868 .. | 93 15 | |
| 12th February, 1868 .. | 70 0 | |
| 6th February, 1868 .. | 40 0 | |
| 1st April, 1866 .. .. | 34 0 | |
| 10th February, 1868 .. | 31 0 | |
| 13th February, 1868 .. | 23 0 | |
| 5th October, 1867 .. | 22 0 | |
| *Albion Company.* | | |
| 29th January, 1866 .. | 60 0 | |
| 15th September, .. | 15 0 | |
| 10th January, 1866 .. | 9 0 | |
| *Kohinoor Company.* | | |
| 22nd March, 1862 .. | 60 0 | |
| 25th July, 1868 .. | 50 0 | |
| 25th July, 1868 .. | 24 0 | |
| 11th July, 1866 .. | 20 0 | At No. 1 shaft |
| 15th October, 1868 .. | 15 0 | |
| 30th September, 1864 .. | 12 0 | |
| 1st January, .. .. | 12 0 | |
| August, 1863 .. | Over 100 0 | In small nuggets |

LIST OF NUGGETS FROM THE BALLARAT GOLD-FIELD—*continued.*

| Date. | Weight. | Locality. | Remarks. |
|---|---|---|---|
| | oz. dwt. | | |
| | | Canadian Gully— | |
| 31st January, 1853 .. | 76 0 | Canadian Gully .. .. | Found at a depth of 60 feet close to No. 2 nugget |
| 12th September, 1859 | 50 3 | Canadian Gully .. .. | Sold for £4 2s. per ounce |
| 28th July, 1859 .. | 36 0 | Near Dunmow Flitch hotel, Canadian | Found near the spot where the first large nugget was found on the lead |
| 3rd May, 1860 .. | 19 0 | At the rear of Dunmow Flitch hotel, Canadian | Found in shallow ground |
| 23rd March, 1867 .. | 90 0 | Lady Don Company | |
| 1st April, 1867 .. | 40 0 | ,, ,, | |
| 30th March, 1867 .. | 30 0 | ,, ,, | |
| 2nd June, 1867 .. | 27 0 | ,, ,, | |
| 9th February, 1867 .. | 17 5 | ,, ,, | |
| 1st March, 1867 .. | 8 0 | ,, ,, | |
| 2nd June, 1867 .. | 6 0 | ,, ,, | |
| | | Little Bendigo— | |
| 6th October, 1858 .. | 20 4 | Surface Gully .. .. | Found by a party of Germans in a small block of solid ground |
| 9th July, 1860 .. | 36 0 | Little Bendigo .. .. | Found by W. C. Green in shallow ground |
| July, 1860 .. .. | 72 0 | Long Gully .. .. | Found by W. C. Green |
| | | Horn of Plenty— | |
| 22nd September, 1862 | 11 0 | Horn of Plenty, Little Bendigo | Found 10 feet from the surface in abandoned ground |
| | | Eureka lead— | |
| .. .. .. | 21 0 | Near the Free Trade hotel | Found in shallow ground |
| | | Black Hill— | |
| 14th October, 1851 .. | 90 0 | Black Hill .. .. | A solid mass of gold |
| 26th March, 1861 . | 16 0 | Black Hill Flat | |
| ,, ,, | 12 0 | ,, ,, | |
| January, 1858 .. | 24 0 | Haphazard Company | |
| | | Nil Desperandum— | |
| 7th September, 1859 | 22 0 | Suffolk lead | |
| 20th June, 1859 .. | 90 0 | Navy Jack's lead .. .. | In old ground; nugget of a cellular appearance |
| 4th July, 1866 .. | 25 0 | Leviathan Company | |
| 21st September, 1866 | 16 0 | Bonshaw Company | |
| ,, ,, .. | 5 0 | ,, ,, | |
| 4th March, 1867 .. | 19 9 | Golden Fleece | |
| 20th December, 1866 | 8 0 | Arrah Na Pogue | |
| 23rd October, 1867 .. | 7 10 | Southern Freehold | |
| 25th February, 1868 | 7 0 | Great Northern Freehold | |
| 4th January, 1868 .. | 5 0 | ,, ,, | |
| March, 1864 .. | 24 19 | All Nations | |
| 9th April, 1860 .. | 40 0 | British Company | |
| | | Red Shirt Party— | |
| 19th December, 1862 | 36 0 | Dalton's Flat .. .. | Found close to the spot where the Lady Hotham nugget was found |
| | | Frenchman's Gully— | |
| 4th July, 1859 .. | 24 13 | Separation lead (Frenchman's Gully) | Found in the reef at a depth of 65 feet |
| 24th April, 1863 .. | 12 11 | Dalton's Flat .. .. | Found at a depth of 40 feet |
| 19th March, 1864 .. | 28 0 | 5 miles from Ballarat .. | Found by three Cornishmen in old ground 8 feet deep. Named the "Duke of Cornwall" nugget |
| 4th January, 1861 .. | 10 0 | Between Ryan's hotel and the Caledonian lead | |

The nuggets given above were found in the alluvial or detrital deposits. In the following list are recorded a number from the quartz reefs at varying depths. The weights in many cases are approximate only, as the specimens were smelted with the gold obtained from the battery, but they are within a few ounces of the gross weight in each instance:—

QUARTZ SPECIMENS.

| Date. | Weight. | Locality. | Remarks. |
|---|---|---|---|
| | oz. dwt. | | |
| April, 1910 .. | 500 0 | North Woah Hawp Company | Several specimens on the indicator at the 950-ft. level |
| 25th December, 1875 | 500 0 | White Horse Ranges .. | Found at a depth of 50 feet |
| January, 1910 .. | *444 0 | Woah Hawp Canton Company | Found on the indicator at the 753-ft. level |
| 25th December, 1875 | 410 8 | Queen Victoria lease, Ballarat | Found on the indicator at a depth of 14 feet |
| 2nd February, 1876 .. | 315 0 | United Black Hill Company .. | Found in five nuggets, the largest being 136 oz., at a depth of 400 feet |
| 1910 .. .. | 300 0 | North Woah Hawp.. .. | Found on the indicator at a depth of 840 feet |
| November, 1910 .. | 266 0 | Woah Hawp Canton .. | An aggregate of several nuggets found during the fortnight on the indicator about 800 feet deep |
| July, 1909 .. .. | 262 0 | ,, ,, .. .. | In nuggets for week on the indicator, 850-ft. level |
| August, 1909 .. | 257 0 | ,, ,, .. .. | Found on the indicator at the 850-ft. level |
| 1889 .. .. | 250 0 | Tinworth's claim .. .. | Found on the indicator |
| 8th December, 1876 .. | *245 9 | Parade Mining Company .. | Found near the line of the indicator at 310 feet deep |
| March, 1910 .. | 200 0 | North Woah Hawp .. | At 840 feet deep on the indicator |

* Represents the actual smelted weight of the gold.

QUARTZ SPECIMENS—*continued.*

| Date. | Weight. | Locality. | Remarks. |
|---|---|---|---|
| | oz. dwt. | | |
| September, 1910 .. | 200 0 | Woah Hawp Canton .. | At 950 feet deep on the indicator |
| June, 1909 .. .. | 194 0 | ,, ,, .. .. | At 850 feet deep on the indicator |
| December, 1910 .. | 190 0 | North Woah Hawp .. | At 950 feet deep on the indicator |
| April, 1910 .. | 180 0 | ,, ,, .. .. | At 950 feet deep on the indicator |
| ,, ,, .. .. | 170 0 | ,, ,, .. .. | Found on the indicator at the 950-ft. level |
| October, 1909 .. | 170 0 | Woah Hawp Canton .. | Found on the indicator at the 850-ft. level. Nearly all pure gold |
| November, 1910 .. | 167 0 | ,, ,, .. .. | On the indicator at 950 feet deep |
| September, 1909 .. | 150 0 | ,, ,, .. .. | On the indicator at 850 feet deep |
| September, 1910 .. | 150 0 | ,, ,, .. .. | On the indicator at about 840 feet deep |
| February, 1910 .. | 137 0 | ,, ,, .. .. | On the indicator at 494 feet deep |
| February, 1911 .. | 132 0 | North Woah Hawp .. | On the indicator at 260 feet deep |
| November, 1910 .. | 130 0 | ,, ,, .. .. | On the indicator at 950 feet deep |
| 2nd February, 1876 .. | 122 0 | Black Hill United Mine .. | Found at 400 feet in depth |
| 1880 .. .. | 120 0 | Dalzell and Buchanan .. | On the indicator at 160 feet deep |
| 11th May, 1874 .. | 114 5 | Black Hill Company .. | At 320 feet in depth |
| 1910 .. .. | 106 0 | Woah Hawp Canton .. | On the indicator at 441 feet deep |
| October, 1909 .. | 104 0 | ,, ,, .. .. | On the indicator at 840 feet deep |
| 1910 .. .. | 102 0 | ,, ,, .. .. | On the indicator at 600 feet deep |
| 1910—1911.. .. | 100 0 | ,, ,, .. .. | On the indicator between 753 and 930 feet deep |
| ,, .. .. | 100 0 | ,, ,, .. .. | ,, ,, ,, ,, |
| ,, .. .. | 100 0 | ,, ,, .. .. | ,, ,, ,, ,, |
| ,, .. .. | 100 0 | North Woah Hawp .. | On the indicator between 840 and 945 feet deep |
| 1896 .. .. | 100 0 | Llanberris Mine .. .. | On the indicator at 453 feet deep |
| 1893 .. .. | 90 0 | New Normanby Mine .. | On the indicator at 805 feet deep |
| August, 1910 .. | 90 0 | North Woah Hawp .. | On the indicator at 950 feet deep |
| July, 1909 .. .. | 90 0 | Woah Hawp Canton .. | On the indicator at 850 feet deep |
| .. .. .. | 80 0 | New Speedwell Mine .. | On the indicator at 390 feet deep |
| June, 1909 .. .. | 80 0 | Woah Hawp Canton .. | On the indicator at 850 feet deep |
| November, 1910 .. | 80 0 | ,, ,, .. .. | On the indicator at 950 feet deep |
| September, 1909 .. | 80 0 | ,, ,, .. .. | On the indicator at 850 feet deep |
| November, 1910 .. | 80 0 | North Woah Hawp .. | On the indicator at 950 feet deep |
| October, 1910 .. | 76 0 | ,, ,, .. .. | On the indicator at 500 feet deep |
| October, 1909 .. | 70 0 | ,, ,, .. .. | On the indicator at 840 feet deep |
| March, 1910 .. | 70 0 | ,, ,, .. .. | On the indicator at 840 feet deep |
| 1914 .. .. | 65 0 | Britannia United .. .. | At 480 feet deep, 45 feet to the east of the indicator |
| August, 1908 .. | 63 0 | New Normanby Mine .. | On the indicator at 1,300 feet deep |
| 1896 .. .. | 63 0 | Llanberris Mine .. .. | On the pencil mark at 453 feet deep |
| September, 1910 .. | 60 0 | North Woah Hawp .. | On the indicator at 950 feet deep |
| March, 1910 .. | 60 0 | ,, ,, .. | On the indicator at 840 feet deep |
| April, 1910 .. | 60 0 | ,, ,, .. | On the indicator at 950 feet deep |
| August, 1909 .. | 60 0 | Woah Hawp Canton .. | On the indicator at 850 feet deep |
| 16th February, 1876 | 57 0 | United Black Hill Company .. | On the eastern indicator at 400 feet deep, in three nuggets |
| October, 1909 .. | 55 0 | North Woah Hawp .. | On the indicator at 840 feet deep |
| 1896 .. .. | 53 0 | No. 1 Llanberris .. .. | On the indicator at 453 feet deep |
| April, 1910 .. | 52 0 | North Woah Hawp .. | On the indicator at 950 feet deep |
| October, 1909 .. | 50 0 | ,, ,, .. | On the indicator at 840 feet deep |
| July, 1910 .. .. | 50 0 | ,, ,, .. | On the indicator at 950 feet deep |
| November, 1910 .. | 50 0 | ,, ,, .. | On the indicator at 950 feet deep |
| October, 1909 .. | 50 0 | ,, ,, .. | On the indicator at 850 feet deep |
| 8th January, 1869 .. | 45 0 | Prince Regent Mine .. | On the indicator at 554 feet deep |
| February, 1910 .. | 45 0 | North Woah Hawp .. | On the indicator at 750 feet deep |
| About 1st August, 1869 | 43 0 | No. 4 Llanberris Mine .. | On the indicator at 600 feet deep |
| August, 1909 .. | 40 0 | Woah Hawp Canton .. | On the indicator at 850 feet deep |
| August, 1910 .. | 40 0 | North Woah Hawp .. | On the indicator at 950 feet deep |
| March, 1910 .. | 36 0 | Woah Hawp Canton .. | On the indicator at 750 feet deep |
| 1899 .. .. | 30 0 | Victoria United Mine .. | On indicator (Duchess slates) |
| 1888 .. .. | 30 0 | Prince Regent Mine .. | On the indicator |
| April, 1910 .. | 27 0 | Woah Hawp Canton .. | On indicator 750 to 930 feet deep |
| October, 1909 .. | 25 0 | New Normanby .. .. | On indicator 1,400 feet deep |
| December, 1909 .. | 25 0 | Woah Hawp Canton .. | On indicator 750 feet deep |
| October, 1909 .. | 22 0 | ,, ,, .. | On the indicator at 850 feet deep |

## LODE MINING.

For many years after the discovery of gold at Ballarat, the rich alluvial sufficed to occupy the attention of most of the "diggers"; but, even from the earliest time, there were men who endeavoured to locate the matrix of the precious metal, and who noticed the quartz reefs. Some broken quartz was sluiced or puddled, but little in the way of crushing appears to have been undertaken until about 1857, though an experimental plant was erected on Black Hill in 1854. In 1857, the first great prosperity of alluvial mining was declining, payable returns were obtainable by the crude treatment of the quartz reefs, and success had been attained at Bendigo by crushing auriferous quartz; these causes led to the erection of crushing plants at Black Hill and at the Old Post Office Hill, and a rush for quartz claims took place on Bakery Hill. Shortly afterwards (1860) a quartz boom set in; every known quartz outcrop was pegged out, and in less than a year over 300 heads of stampers were erected. Reaction followed; many costly plants were sold for mere trifles, and the general public, who contributed to the boom, now had an aversion to quartz mining. A few paying mines continued to work, but they gradually dwindled away as the more attractive alluvial mines on the deep leads boomed towards the end of the 'sixties. The Black Hill, the Llanberris, the Endeavour, and the Old Post Office Hill mines struggled until the 'eighties, sometimes prosperous, sometimes poor. The Sovereign Company, and the Canadian Gully Company began operations at the same time as the Old Post Office Hill group. On the western field, the Township Reef was early known, and it participated in the quartz boom of the early 'sixties. While the alluvial was being worked, quartz reefs were intersected in the workings and tested. Among the most important discoveries made in this way was that of the Prince of Wales Company, which combined quartz and alluvial mining in the 'sixties; but, with the swamping out of the alluvial mines, the quartz workings were flooded.

During the early 'sixties, the Burra Burra Company erected a large battery to crush a huge formation, but the stone proved unprofitable (see p. 81).

During the 'seventies, after the alluvial was worked out, attention was again paid to the quartz. Another boom set in with the discovery of a rich lode in the workings from the Band and Albion Company's No. 6 shaft, in 1879, and in this Ballarat East participated, as well as Ballarat West—where the Redan, the Township, and the Sebastopol groups of mines were started. At this time, the most successful of the quartz mines had begun operations. The chief were the Star of the East, and the Band and Albion. At Ballarat East, the now existing New Normanby, the North Woah Hawp, the Llanberris No. 1, the Last Chance, the Britannia, and the Victoria United Companies, or the parent companies, were formed in the 'eighties. The Sulieman Pasha, the United Black Hill, the Dalzell and Buchanan, the Woah Hawp Canton, the Parade, and several small claims, yielded well at this period, but closed down during the 'nineties. In the early 'nineties, the profitable mines at Redan and Sebastopol were reduced to the New Kohinoor, the Sir Henry Loch, the Band and Albion, and the Star of the East. In 1895, and the following couple of years, the South Star and the Central Plateau Companies had short careers of prosperity. Quartz mining at Sebastopol and Redan was continued with vigour until well into the present century by the Prince of Wales and Bonshaw, the Sebastopol Plateau No. 1, the Central Plateau, the South Star, the Star of the East, the Band and Loch, the Northern Star, and the New Kohinoor mines, but with unprofitable results, except for a short time in the case of the Star of the East Company. The chief reasons for this want of success were that the areas were too extensive to mine by ordinary means, the drainage from the waterlogged alluvial overhead was excessive, the character of the reefs was not recognised, and expensive, misdirected prospecting was carried out.

In 1905, the South Star, the Central Plateau, the Sebastopol Plateau No. 1, and several other mines, were re-opened; but no new shoots were located; and by 1910, the whole of the western field was swamped out, owing to the cessation of pumping at the Star of the East and at the Band and Loch mines. The last mine of the group to close down was the New Kohinoor, where a prospecting cross-cut was being driven easterly at the 580-ft. level, at a point nearly a quarter of a mile north of the shaft. At the present time, the only quartz mining at Sebastopol is being carried on by the Central Plateau and the Central Plateau Extended mines, where new shafts have been sunk, remote from the influence of alluvial waters, and close to the line of reef which it is proposed to test.

At Ballarat East, the Llanberris No. 1 Company, an offshoot from the Llanberris Company of 1860, is the best producer. Prospecting operations are being carried on at depths ranging from 700 feet to 1,600 feet with varying success. In 1915 the New Normanby Company attained 1,600 feet, the greatest depth reached at Ballarat East.

### STRUCTURE OF BALLARAT WEST GOLD-FIELD.

A main anticline, which forms, as it were, the backbone of the field, traverses the centre of the Sebastopol Plateau in a N. and S. direction. This anticline may be designated the Albion or Prince of Wales.

The Albion anticline is 130 feet west of the Prince of Wales and Bonshaw United shaft; 1,320 feet west of the Sebastopol Plateau No. 1 shaft, where a drive north and south gives a general strike of N. 1° W. for a length of 200 feet; and 950 feet west of the Star of the East No. 2 shaft. Northwards no observations were made. For 1,000 feet west of the Albion anticline in the Star of the East mine the strata dip west to the Albion lode, and at the 1,100-ft. level a cross-cut west 80 feet from the lode was still in west-dipping strata.

At the 600-ft. level, Central Plateau No. 2 shaft, the strata dip west between the syncline at the shaft and the Albion lode-channel, which lies 350 feet to the east. Further north the syncline appeared to bifurcate, for an anticline is exposed at

30 ft. east of the shaft of the Central Plateau Extended. On the west side of the Albion anticline the Albion lode is a laminated quartz reef, well defined though small in some places, and is associated with a series or zone of black slates and pyritic seams. At the Central Plateau No. 2 shaft this zone is 110 feet thick. Similar strata occur west of the Albion lode in the 1,100-ft. level of the Star of the East mine. This lode was reputed to be crossed in the alluvial mines west of Pleasant-street as far north as Lake Wendouree. In the Northern Star mine the lode was cut at 2,425 feet west of the shaft in the cross-cut at 1,250 feet. Correlation with the Prince of Wales lode is difficult owing to insufficient data. From the sections available, it appears as though the strata west of the Prince of Wales and Bonshaw shaft dipped east to an anticline at 130 feet; beyond that point the strata dipped west. Drives north at levels from 714 feet downwards followed east-dipping strata for several hundred feet before meeting the lode, which dipped west and pitched south. This might be expected, since the Albion anticline was passed through in the north drive. The general strike of the worked portion of the lode was N. 10° W., and the Albion anticline, which strikes N. 1° W., would have a southern pitch. About 100 feet west of the Prince of Wales lode, a parallel lode dipping west was met with in each of the levels.

In the Sebastopol Plateau No. 1 mine, at 1,730 feet west of the shaft in the 900-ft. level, a lode identical in character and appearance with the Prince of Wales was passed through, and a parallel formation was found 100 feet further west. In the workings of the Central Plateau No. 2 shaft, the black slate zone is exposed; it contains two parallel lode tracks, 100 feet apart, which, to judge from their strike, are very probably the continuation of the Prince of Wales lode. If this suggestion is correct, the Prince of Wales and the Albion lodes are one and the same.

At the Star of the East mine only one cross-cut has been driven west of the Albion lode, and this passed through a large body of quartz at a distance comparable with that of the parallel western lode, but no work was done on it to the north or south.

Eastward from the Albion anticline, in the vicinity of the Star of the East mine, the prevailing dip is easterly to a main syncline which lies about 850 feet east of No. 2 shaft. This syncline may be designated the Consols syncline. The South Star shaft is located in the centre of this syncline, which may be traced northwards by underground sections to near Macarthur-street. The fold strikes N. 1° W., but it has been displaced by cross-courses, and it appears to strike almost exactly north and south. In the Ballarat North Prospecting mine the fold lies 800 feet east of the shaft; in the Ballarat City Prospecting, 660 feet west of the shaft; the Kohinoor, 550 feet west of the shaft; in the Band and Albion, 850 feet east of No. 9 shaft; and in the Star of the East, as mentioned above, 850 feet east of No. 2 shaft. In the Band and Albion and the Star of the East mine a small anticline occurs in the centre of the syncline, thus splitting the main fold into two smaller ones.

Between the Albion anticline and the Consols syncline, several folds of more or less the one size occur. In most cases, these appear to strike a little E. of N. from the east-dipping flank of the Albion anticline to the Consols syncline. The most symmetrical folding between the main folds is exposed in the Band and Albion section (Pl. 6), where a syncline occurs 100 feet west of the No. 9 shaft. The Guiding Star lode was worked on this syncline, which may be designated the Guiding Star syncline; it occupies a position midway between the Albion anticline and the Consols syncline, and though much compressed in the upper levels, it carries the black slate horizon to a depth of 1,300 feet, while on the Consols syncline the black slates are at a depth of about 2,000 feet. The Guiding Star syncline pitches north, and passes 100 feet west of the Northern Star shaft; further north no sections were accessible. To the south it strikes towards the Albion anticline. An anticline (the Guiding Star anticline), which is about 450 feet east of the Guiding Star syncline in the neighbourhood of the Band and Albion No. 9 shaft, converges towards it in a southerly direction, and syncline and anticline probably merge into each other at a point about 600 feet south of a line west of the Central Plateau No. 1 shaft, and there the Guiding Star lode probably terminates. Other folds on which no lodes have been proved occur between the Albion anticline and the Consols syncline, the absence of lodes being due to the absence of the black slate. These are dealt with in the descriptions of the several mines.

A payable lode (the Phœnix) was worked in a syncline west of the Sebastopol Plateau No. 1 shaft; this syncline is described in the paragraphs dealing with the Sebastopol Plateau No. 1 mine (page 194).

The chief developments of quartz on the Guiding Star and Phœnix lodes occupied the troughs of synclines. Spurs of exceptional richness were worked east of the Consols lode in the shallow levels of the Band and Albion and other mines, this group forming a connecting link with the Ballarat East mines.

Between the Band and Albion and the Star of the East mines the pitch of the Consols syncline changes; northwards the pitch in the deep levels of the Band and Loch was 5° N., while in the Star of the East the pitch was 3° S. At the Star of the East No. 2 shaft the black slate horizon on the fold would reach a depth of about 2,300 feet, and in the South Star a depth of 3,500 feet would be attained on the Consols syncline opposite the shaft. Further south, no information was available as to the pitch of the syncline, but the flanking folds, such as the Phœnix and others westwards in the Sebastopol Plateau No. 1 mine have a northerly pitch ranging from 1° to 8°.

Eastwards from the Consols syncline the Consols anticline passes through the Band and Albion Nos. 7 and 10 shafts, and through the adjacent group of mines. On the anticline, rich spurs and lodes were met with under the alluvial on what appears to be a dome, the fold pitching north to the Kohinoor and south to the Star of the East No. 1 mine (Pl. 7a). The Consols anticline lies 120 feet west of the Kohinoor shaft, passes through the Sir Henry Loch and the Band and Albion No. 10 shaft, east of the Star of the East No. 1 shaft, and 120 feet east of Gay's Band United shaft (Fig. 26), the most southerly point of which I have information. Saddle reefs and allied formations were worked in the Band and Albion mine, and spurs, &c., eastwards thereof in a number of small freehold claims in the vicinity. The Sir Henry Loch Company worked a shoot of [illegible] on the west leg, from the anticline at 550 feet to the syncline at 2,080 feet (Pl. 5).

Another shoot of gold pitching south, and apparently associated with the western flank of the anticline, was worked southwards from the Sir Henry Loch to the southern boundary of the Star of the East (Pl. 7a).

In the Gay's Band United mine a saddle reef was worked on the Consols anticline in 1891. It pitched south at 1 in 2, or 26°, and was associated with one of the upper beds in the black slate series (Fig. 26). The large formations in the Band and Albion Nos. 7 and 10 shafts also occurred between the upper and lower beds of the black slate series. Northwards, the pitch changes; in the Kohinoor it is northerly, and 800 feet north of the shaft the black slate series pitches underfoot at the 580 ft. level. The black slates have not been located north of the Kohinoor mine.

The northern end of the Consols anticline lies 260 feet west of the Ballarat City Prospecting Company's shaft, and pitches south. Eastwards from the Consols anticline a syncline and an anticline are exposed in the Kohinoor and the Ballarat City Prospecting mines, but the black slates appear to have died out eastwards of the Consols anticline, and are not exposed in these folds. What appears to be a main fold lies east of Dawson-street, the cross-cut from the Kohinoor mine at the 580 ft. level passing through west-dipping strata for a distance of 900 feet. To the north or south the position of the anticline cannot be definitely located, as no rock exposures are available.

The Ballarat West lodes pitch north from a series of domes which extend diagonally from south of the Sir Henry Loch shaft to north of the Star of the East No. 2 shaft.

## STRUCTURE EAST OF THE BALLARAT WEST FIELD.

Surface outcrops in the Woolshed and the adjoining gullies eastward of this anticline reveal overfolded strata, the axis of the folds having an easterly list; the western limb, on account of this, dips at angles from vertical to 65° east, while the eastern limbs have a flat angle of dip. Exposures are confined to gully sections, no mine workings being available (see Figs. 21 & 22).

In the eastern part of the field between the Yarrowee and Canadian lead a main anticline or anticlinorium, much crumpled in its centre, occupies a position on the crest of the ridge 16 chains west of the North Woah Hawp shaft. To the

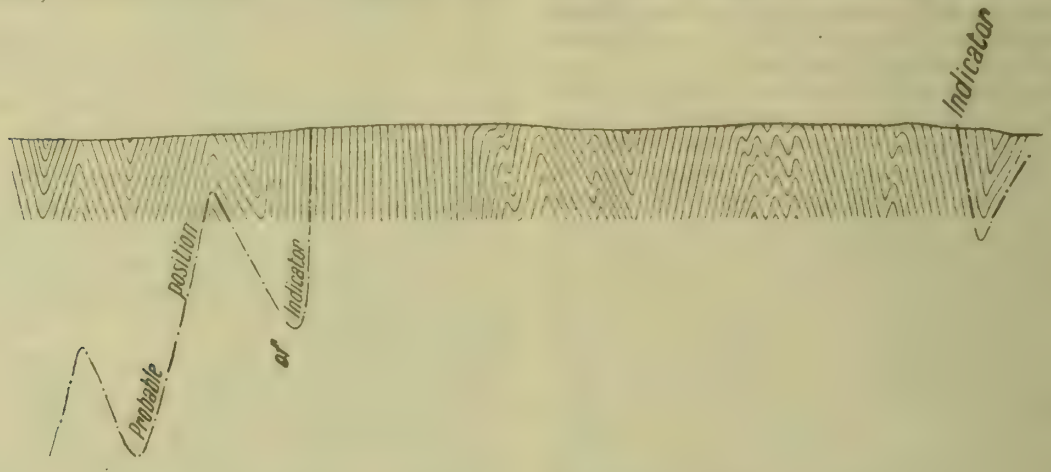



Fig 21. Generalized Section along Miner's Right and Terrible Gullies. Not to scale.

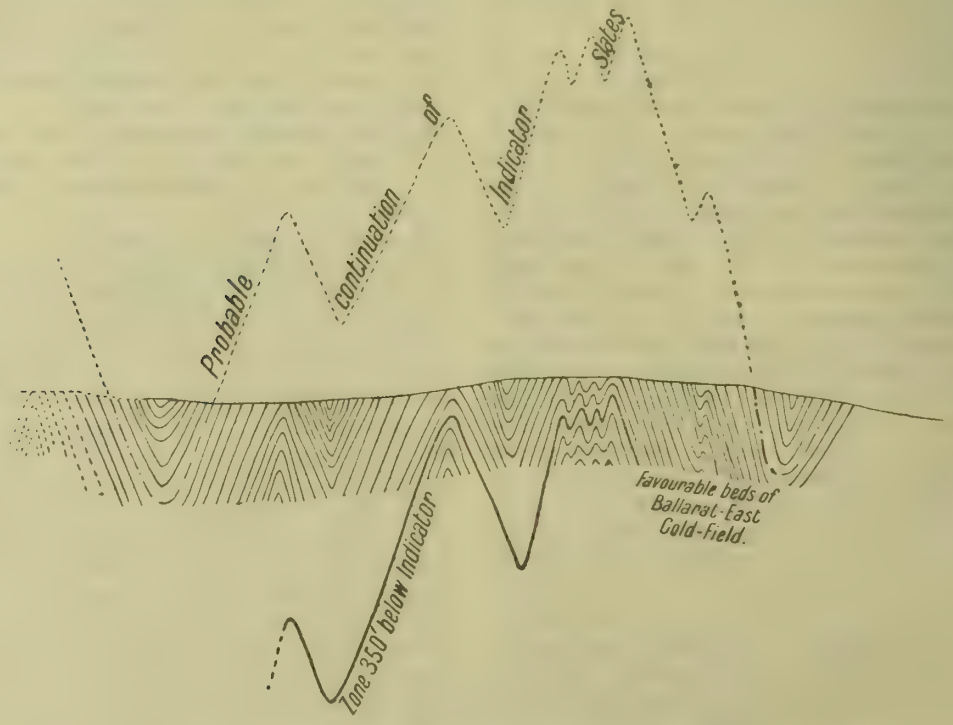



Fig. 22. Generalized Section west from Indicator through Sovereign Hill. Not to scale.

east of this fold overfolded strata with minor folds having a general easterly dip are exposed in the various underground sections.

A main syncline (or geosyncline) occupies a position in One Eye gully about 2,200 feet east of the anticlinorium; eastwards from this, the strata dip west for 10,000 feet except for a minor fold at the Yorkshire dyke and the Temperance mine in Little Bendigo. At the Temperance mine a black slate series is exposed in the shallow levels; these slates have not been correlated with the western series, but they are similar in appearance, and the zone is from 80 ft. to 100 ft. thick.

An attempt to correlate the western black slate series with the Indicator beds of Ballarat East proved unsatisfactory owing to the varying pitch of the folds and the gap between the most eastern workings in the western mines (the eastern face of the northern crosscut, 580 ft. level in the New Kohinoor) and the most westerly section in Woolshed Gully. It is highly probable, however, that the Eastern or Indicator beds occupy a lower position than the western black slate series, and that the anticlinorium west of the Indicator workings represents the main axis of the field. It is therefore possible that the Temperance zone is a repetition of the black slate zone of Sebastopol, but this is not supported by sufficient field evidence to be more than a suggestion.

## STRUCTURE OF THE BALLARAT EAST GOLD-FIELD.

The structure of Ballarat East, while presenting features in some respects analogous to those prevailing at Ballarat West, differs chiefly in the more highly folded beds comprised within the auriferous portion.

Unlike the lodes of Ballarat West, the Ballarat East formations strike from north and south to N. 5° E. and cut across the strata, which range in dip from vertical to 70° E., where the lodes are profitable. The lodes are profitable only where associated with east-dipping beds. The Ballarat East belt is traceable by workings for a length of 400 chains and a width of 15 chains. It consists of two parallel series of formations, so far as developed at present, known as the Sulieman or Sediment line and the Indicator or Pug line. These parallel lines occur in analogous positions in the same geological horizon on the eastern flanks of two parallel anticlines. The spurry quartz formations, from the thickness of a knife edge to several feet, are noted for coarse gold, and are the source of many of the nuggets found in the alluvial by the early miners.

In the Ballarat East belt the southerly pitch at the southern end is not apparent, but it is strongly suggested and would account for the non-auriferous southern extension of a portion of the Ballarat East field. The southerly pitch exposed near the Temperance mine harmonizes with this view.

The northern limit of the series is roughly parallel to the southern limit, and is well marked by a northerly pitch which terminates the Ballarat East belt at Black Hill.

Eastwards from the Indicator belt a parallel anticline has been met with in the Victoria United, the Britannia, and the Last Chance mines, and features identical with the main lines occur along this line. The main anticline (on the west of the Indicator) outcrops at Black Hill along the edge of the open cut, where the beds favorable for gold end on reaching the anticline. In cuttings, shafts, tunnels, &c., the anticline is traceable to the alluvial on the banks of the Yarrowee Creek. In the workings of the Victoria United, the Britannia, the Last Chance, and the Llanberris No. 1 mines the anticline forms the western limit of the "Indicator" country, and along it Dunn's lode was worked in the Britannia and Robert's lode in the Llanberris mine. On Sovereign Hill, where the bedrock is again exposed, the anticline shows to the west of the Sovereign shaft. In the New Normanby, the North Woah Hawp, and the South Woah Hawp mines the fold shows at various levels in the western cross-cuts.

The anticline to the west of the Sulieman Pasha lode was observed only in the workings of the North First Chance Mine and in a cross-cut west from an old drive from the Llanberris Company's No. 3 shaft, which was connected to the stopes of the First Chance Mine. This anticline was shown by Lidgey to be traced as far south as the North Prince Extended shaft, which is situated to the south-west of the North Woah Hawp.

Absence of surface exposures makes the structure of the field difficult to follow, and, with the widely scattered and the intermittent nature of mining operations on the side lines, even underground sections are not easily obtained. The structure of this portion of the field as far as it could be ascertained is given with the description of the various mines where surveys were made.

## STRUCTURE OF YORKSHIRE AND LITTLE BENDIGO BELTS.

Eastward of the Ballarat East field is an isolated belt known as the Yorkshire and Nil Desperandum reefs, on which no mining has been done for many years, but from the old workings it is apparent that a large decomposed dyke, upwards of 30 ft. wide in places, was associated with the auriferous quartz, though no sections are available. The gold occurred in quartz spurs which traverse the strata in the vicinity of the dyke. This belt is 20 chains long and 5 chains wide. Southward, on the extension of this line, some large nuggets were discovered, and the alluvial in the neighbourhood of the Yorkshire reef was reputed to be rich.

The Little Bendigo mines are similar in some respects to the Ballarat West and Sebastopol mines. The Temperance lode, which may be taken as the most westerly of the Little Bendigo group, lies 40 chains east of the Yorkshire belt. It is a bedded lode of highly mineralized laminated quartz from an inch or less to several feet thick, in a narrow zone containing black slates, which are not found in any of the overlying or underlying strata. The lode dips west at 65° to 75°, and has been traced for a distance of 2,000 feet. A minor fold or roll pitching south at 10° to 25° occurs to the west of the outcrop, and the shoot of quartz was found to pitch in the same way, and from particulars available it was apparent that the shoot was worked to the roll only. A quarter of a mile to the east is Dimock's series of reefs, a number of narrow, vertical, laminated formations, from a thread to a foot in width, and confined to a bed of purple slate upwards of 100 ft. wide. They

extend vertically from wall to wall of the slate, and die out on the sandstone. The slate bed dips 70° to 75° W. This series of reefs has been traced from the northern outcrop to the alluvial at Yarrowee Creek, a distance of 2 miles, and still further south similar reefs occur in the workings of the Eastern Star Freehold, a section of which is shown in Fig. 23.

There is little doubt that the pitch changes further south than where the auriferous belt terminates; the southern extension of the Little Bendigo belt is exposed near York-street with a strong pitch north, but few of the veins have proved profitably auriferous in this locality, although a nugget weighing 100 oz. was found in the neighbourhood in 1910.

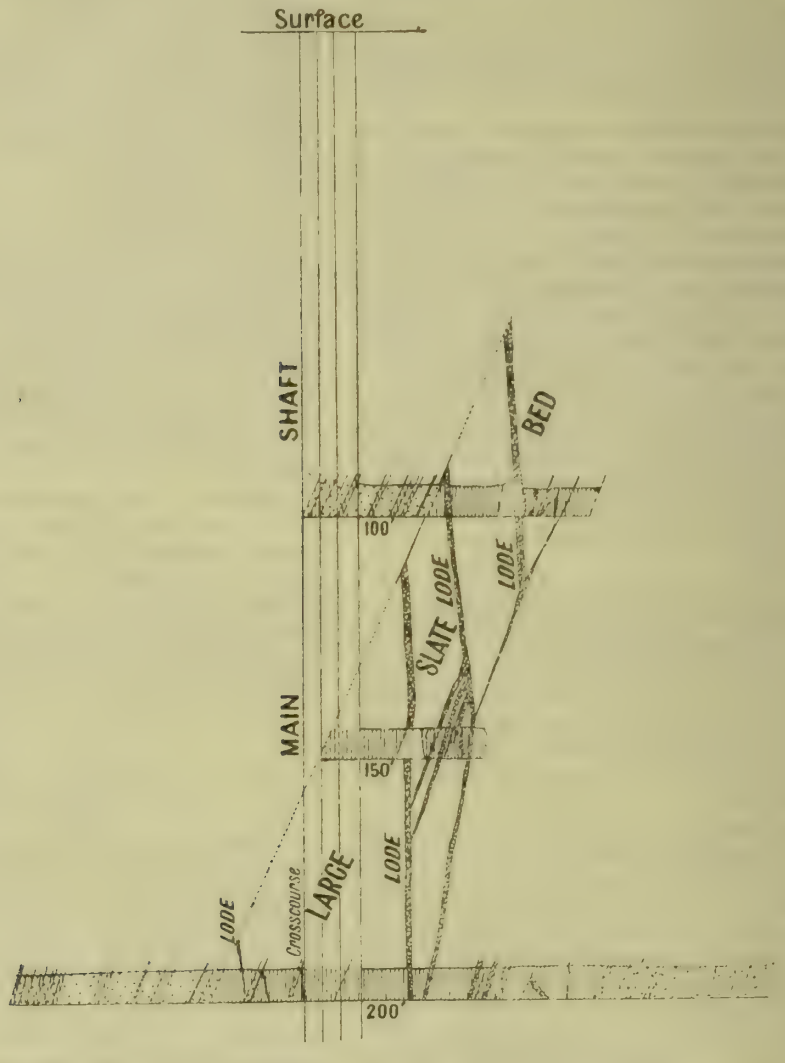



FIG. 23. Transverse Section, Eastern Star Mine. Scale :—40 ft. to 1 in.

The most easterly series of the Little Bendigo belt is the Monte Christo line. Here a bed of favorable slate and sandstone, 1,000 ft. stratigraphically below Dimock's slate, dips westerly. On both walls of this zone slipping on the bedding planes has occurred. The quartz formations consist of a mass of more or less nearly horizontal spurs, which extend from wall to wall, usually nearly at right angles to the dip of the strata, and pitch 5° to 15° S. The individual spurs vary from a few inches to several feet in depth, judging by the surface outcrop. Deeper shaft sinking appears to have been so placed as to reach beyond this mass of spurs in their southerly pitch.

Reviewing these beds, we find a parallel series of lodes, which, in the outer belts at any rate, are cut off to the south by a decided southerly pitch. The southern boundary takes a diagonal course parallel to the strike of the main crosscourses, i.e., N. 45° E.

At Little Bendigo, the northern extension has not been studied in detail.

## QUARTZ FORMATIONS.

The classification of the lode formations adopted as the result of investigations carried out during the survey is—

A. Lodes—
- (*a*) Bedded—
  - (1) Lodes associated with certain beds.
  - (2) Saddle reefs.
  - (3) Verticals.
- (*b*) Fissure—
  - (1) Leather-jacket formations.
  - (2) Upper and lower portions of type (*a*) 1.

B. Spurs.

While this classification serves to distinguish typical cases, the line of demarcation is at times not distinct; thus the bedded lodes occupy planes of movement, at times small and parallel to the bedding planes, and are therefore allied to the fissure lodes. Further, these lines of movement in the neighbourhood of the anticlines and synclines

cut across the beds, forming for a short distance a fissure lode and, more distant, spurs. Similarly with the fissure reefs of the leather-jacket formations, which on reaching the anticline or syncline die out as slides along the bedding planes. Again, the occurrence of spurs in broken strata form large formations, which in size and value exceed the true lodes.

The bedded lodes are developed in the Ballarat West portion of the field, and are intimately associated with the black slate zone. The strike of the lodes and associated slates ranges from N. 30° W. to N. 5° E., and varies according to the pitch of the anticlines. Along the black slates slipping on cleavage or bedding planes has allowed the growth of laminated quartz formations of remarkable continuity on either leg of the anticlines and synclines. While persistent, the quartz is often small, ranging from half an inch to rarely 6 inches as an average. Enlargements or "shoots" occur in some places, with no apparent regularity, as at the Sir Henry Loch, the Band and Albion No. 7 and 10 shafts, the Star of the East No. 1 and No. 2 shafts, the South Star, the Central Plateau, and the Sebastopol Plateau No. 1 mines. These enlarged portions have proved in most instances to be the more highly auriferous, and in the mines mentioned above, with the exception of the Sebastopol Plateau No. 1, have afforded much payable ore. The lodes when thin or narrow rarely carry gold, and numerous assays have failed to reveal more than a trace.

Towards the apex of the anticline and the trough of the syncline the bedded lodes increase in width, the extension of slip surfaces into the folded strata is usually apparent, and thus tends to form fissure lodes of the second type. The enlargement of the bedded lodes near the anticline was noticeable at the Kohinoor Company's 580-ft. level in the drive north going towards the apex of the fold which pitched in that direction; the quartz increased from a few inches to several feet in width. A similar feature was revealed in a rise above the 1,000-ft. level at the Sebastopol Plateau No. 1 mine before reaching the anticline.

The faulting or slipping along the lodes where developed through the folded strata produces an overlap of one wall,[1] which causes the lodes to be less regular at such points, but the gold contents were at times found to be present in such positions as in the upper levels of the Band and Albion Nos. 6, 7, and 10 shafts, the Sergeant's Freehold and adjacent mines, and the New Kohinoor shallow levels. The bedded character of the lode between two graphitic walls was apparent at lower levels, but only one wall was present in the upper workings.

The character of the bedded lodes from anticline to syncline varies thus—

> Above the anticline, is a well-defined hanging wall with irregular footwall; width of lode variable (type A. b2).
>
> Where the lode is bedded, both walls are well defined; the width of lode is fairly constant, and ranges from a few feet near the folds to a few inches, on an average, in the portion between them (type A a1).
>
> Below the syncline, there is a well-defined footwall, the hanging wall is irregular and carries spurs, and the width of lode variable, though at times very large.

[1] *Berringa Gold-field*, by W. Dragwanath, Mem. Geol. Surv. Vict., No. 6, Figs. 1 and 2.

Except at the Prince of Wales and Bonshaw mine, where at times the lode on the uppermost black slate carried gold in payable quantities, and probably also at the Nos. 7 and 10 upper levels of the Band and Albion Company, little gold was found associated with the quartz lodes unless developed on the lowest or deepest black slate bed of the series.

Only on the western dip have the bedded lodes of Ballarat West proved auriferous. They have been proved over a length of 3 miles, and from east to west they are known as the Consols, the Guiding Star, and the Albion, or Prince of Wales; the east-dipping legs were always small, and never carried gold values where passed through in the mine cross-cuts. In the Sebastopol Plateau No. 1 mine, in the rise above the 1,000-ft. level, the upward extension of the east leg above the saddle was found.

The quartz forming the lodes of Ballarat West is typically laminated with graphitic casings and black slate partings. In the upper and lower extensions one wall is usually laminated, and this is noticeable in the formations, whether of large or small dimension.

The minerals usually present in the laminated lodes of Ballarat West and Sebastopol comprise iron pyrites with galena and sphalerite, the latter two being conspicuous where the quartz is auriferous. Arsenical pyrites in abundance was noticed in the 580-ft. level of the New Kohinoor mine (Consols lode), but the gold values were low. At the 2,080-ft. level in the Band and Loch mine, arsenical pyrites was present in the stone of payable quality, which formed the downward extension of the laminated portion of the Consols lode. At the 1,310-ft. level, Band and Albion No. 9 shaft, the Guiding Star lode was highly mineralized, and the bulk of the mineral was arsenical pyrites, and Krause[2] records traces of antimonial minerals, as well as copper pyrites in the mine.

Detail of the lode formations of the Ballarat West and Sebastopol field will be found under the headings of the various mines.

### SADDLE REEFS.

Where the slipping along the bedding planes has been confined to a small longitudinal movement on the apex of the anticline or trough of the syncline, saddle and inverted saddle reefs are formed.

While not a conspicuous feature on the field, both forms of saddle reefs were found. The most noticeable of the anticlinal or true saddle type are the Robert's lode in the Llanberris, Dunn's lode, 720-ft. level in the Britannia, the so-called Indicator lode 60 feet west of the Victoria United shaft at the 1,305-ft. level, a poor though well-defined formation in the west cross-cut off the north drive 622-ft. level First Chance mine, and the 830-ft. level east cross-cut of the New Kohinoor mine.

The chief occurrence of the inverted or synclinal saddle reef was the gold-bearing formation known as the Phœnix lode of the Sebastopol Plateau No. 1 mine, and also some minor reefs exposed in the same syncline at the 378-ft. and 563-ft. levels.

[2] *Introduction to the Study of Mineralogy*, by F. M. Krause, 1896.

The extensive lode formations of the Star of the East (No. 2 shaft), the South Star, and Central Plateau mines on the Guiding Star lode terminated in the syncline, while on the Consols lode a similar enlargement occurred at the 2080-ft. level of the Band and Loch mine, below which no gold was met with.

VERTICALS.

The "verticals" or bedded reefs of the Ballarat East mines form a small and unimportant group. In general character they somewhat resemble the lodes of Ballarat West, but they are usually small, coarsely laminated, often largely dolomitic, and of varying width from ¼ inch to 3 and 4 inches. While never auriferous, these verticals frequently mark the points of enrichment in spurs which they intersect. The quartz in the verticals is usually vitreous, and commonly stained either green by chloritic minerals or milky white with associated dolomite.

FISSURE REEFS.

Forming a distinctive group apart from the extensions of the bedded lodes, the fissure reefs of the leather-jackets or slides are the most productive of the quartz occurrences of the Ballarat goldfield. Although confined, as they are, to the eastern belt, they constitute the large ore bodies which have been so important from a gold-production point of view.

The leather-jacket formations are associated with a recurring series of strike faults ("slides") running roughly parallel with the strike of the strata and dipping west at an average angle of 45°. These faults or fissures are accompanied by movement ranging from 25 feet to 70 feet, the uppermost portion or hanging wall having moved upwards. While a fault course is usually present, at times the comminuted strata have been silicified to form a breccia, and a dig, pug, or wall is absent. Dyke material at times is present along the fault lines, forming "the pug" or "the sediment" of the Indicator and the Sulieman belts. In size and continuity the lodes of this type are usually erratic, but they are roughly lozenge shaped, both vertically and horizontally. One wall is common, either forming the footwall with spurs passing into the adjoining strata on the headwall side, or where there is a good headwall a spurry footwall occurs. Including the spurs which form portion of this type of lode, the ore body is sometimes 100 ft. wide. During the survey, solid bodies of quartz over 20 feet in width were noticed north at the 1,405-ft. level in the Victoria United mine, at the 792-ft. and 1,035-ft levels in the Britannia United mine, 935-ft. level in the Llanberris No. 1 mine, 1,200-ft. level in the New Normanby mine, and 1,300-ft. level in the North Woah Hawp mines.

Though not of uniform quality throughout, the quartz occurrences of this type are seldom barren, but when intersecting certain favorable beds they are more highly auriferous. Thus a large body of quartz may prove auriferous at 100 feet west of the Indicator in one mine and in an adjacent mine the intersection of the favorable bed with the quartz occurrence may be in such a position that but little quartz is developed. The blocks or lenses of quartz are not confined to certain beds, but form fairly regular and consistent "makes." The quartz development is largely restricted on these leather-jacket faults to the fissured beds, and in the downward continuation of the faults lying along the bedding planes the fault action is modified; and, as a consequence, with the absence of crushing, there is less space for the introduction of quartz veins. As has been proved by the structure of the various mines, the leather-jacket faults recur, and consequently the leather-jacket formations. It is therefore apparent that when one formation is approaching the anticline another formation is beginning to form near the syncline to the east.

The quartz forming the leather-jacket formations is never laminated, and in colour it is commonly white, rarely vitreous, and vughs containing crystals are common in the larger bodies. Felspar with kaolin and dolomite are present chiefly as marginal formations or in the adjoining veins. Sulphides occurring as pyrite, marcasite, galena, sphalerite, pyrohotite, chalcopyrite, and arsenopyrite occur with gold in the quartz. Chlorite and pholerite occur less frequently.

The presence of both kaolin and felspar in both the shallow and the deepest workings (1,600 feet) on the Ballarat East field suggests the possibility of two distinct felspars having been originally formed, of which one has decomposed, leaving the albite variety in an unaltered condition. This feature was also noticed to a depth of 2,080 feet in the Band and Loch mine, Ballarat West.

SPURS.

Scattered throughout the strata of the field, and not occurring with any regularity, are numerous spurs or masses of quartz of varying size and continuity. Though irregular in their gold values, the quality of these spurs at times has caused much attention to be paid to them. The chief belt of strata wherein this has been the case is along the "Indicator" belt of Ballarat East, where owing to torsion or dynamic agencies the strata are fractured and disturbed, and the spurs are more regularly developed.

Spurs not associated directly with any apparent faulting occur throughout the whole of the Ballarat East belt. At Black Hill, spurs with a thickness of 6 and 8 feet are noticeable. In all the mine workings they are conspicuous, at times forming stockwerkes many feet in width. A typical mine where spurs were largely developed and proved payable was the First Chance (see p. 112-114).

At the Yorkshire dyke spurs occur in association with the dyke, but owing to the absence of any recent shafts or workings the relation cannot be established.

On the Ballarat West field an auriferous spur was located at the Ballarat Prospecting Company's 378 ft. level, and yielded several ounces of gold, but the vein was an isolated one.

In the Star of the East Company No. 2 shaft, at a depth of 2,000 feet, a vein upwards of 80 ft. in width was stoped for several hundred feet in length, and ranged from 3 feet to 6 feet in thickness.

These spurs cannot be directly ascribed to any folding movements, but at a depth of 2,080 feet in the Band and Loch mine on the Consols lode, at 1,100 feet in the Star of the East No. 2 shaft, at 1,000 and 1,100 feet in the South Star, and 900 feet in the Central Plateau a series of spurs in the vicinity of the syncline was met with and proved auriferous in part.

At the 1,800 and 1,900-ft. levels in the Band and Loch mine, and west of the Guiding Star syncline a mass of flat spurs making away from

a fault line were stoped, the spurs ranging from 30 to 40 feet in width, and from 2 to 6 feet in thickness.

In the Sebastopol Plateau No. 1 mine spurs to the west of the syncline were worked at the 287-ft. level, and crystal gold was found in them at times. At the 900-ft. level 870 feet west of the shaft a large spur consisting of quartz and albite was exposed.

Comparing the western field with the eastern one a marked difference in the quantity of spurs and lodes is apparent; while on the eastern field spurs are common, on the western line, except in the vicinity of the folds, quartz is strikingly absent.

A noticeable feature in the occurrence of spurs in the Ballarat East belt, where a number have been worked, as on the Indicator, is that a number of spurs occur roughly parallel to one another in pitch. As an example, the Woah Hawp Canton mine may be cited, where the spurs pitched north to a depth of 600 feet, below which they pitched south.

It is frequently asserted that only spurs pitching in one direction are payable, but field evidence does not support this theory. It is probable, however, that closely associated spurs pitching in the same direction are contemporaneous, and have participated in the gold deposition at the one time; and that spurs pitching in the opposite direction were formed at another period.

### AGE OF THE QUARTZ REEFS.

Definite means of ascertaining the age of the quartz formations are not readily available. All the quartz is later than the folding of the containing strata. The continuity of the Ballarat West lodes leads one to infer that they probably were continuous over folds which have since been denuded many thousands of feet.

That the quartz deposits are not confined to one age is apparent; the bedded reefs appear to belong to an age superior to the fissure reefs and spurs.

Along the granitic dyke in the Star of the East Company's No. 2 shaft, a quartz vein was formed on the selvage, and from its position it was probably of later date than the dyke intrusion. The granitic dyke will intersect the Albion lode between the Central Plateau and the crosscut from the Sebastopol Plateau No. 1 mine. This intersection would provide valuable data as to the relative age of dyke and lode.

In the Last Chance mine above the 892-ft. level on the Indicator belt of strata, and also in the First Chance mine at the 622-ft. level on the Sulieman belt of country, the "pug" and "sediment" dykes both intersected quartz spurs, and were intersected by quartz veins.

A similar behaviour is noticed in the leather-jacket faults, one stage of the movement, probably towards the end, having cut through the quartz veins and slickensided the surfaces. Cases of quartz veins cutting these faults are rare, but dolomite veins of this age are frequent.

The crosscourses are all later than the quartz veins, much quartz being found in the "drag," but as the movements along these faults are still in progress, the test of age is not of merit.

The basic dykes are similarly of more recent origin than the quartz veins.



## THE INDICATORS AND FAVORABLE BEDS.

The occurrence of the numerous nuggets on the Ballarat East field and their close association along a definite series of lines caused the earlier miners to speculate as to their origin and distribution. It was not until the early "seventies," when the discovery of specimens containing large quantities of gold in situ in the quartz reefs had attracted the attention of the miners, and led them to follow certain belts where the specimens had been met with more or less regularly, and where certain peculiar associated features were recognisable, that these favorable belts were classed as Indicators. There appears little doubt that, from the first recognition of the favorable beds, more than one indicator was followed, but the most favorable and the best-defined one was regarded as The Indicator, and then the relation of the lines to the east and west of it were correlated. Credit for the recognition of The Indicator is given to Morgan Llewellyn, who successfully worked the quartz veins along its course at the Black Hill Flat in 1871. Although not classed as indicators at that time, parallel beds known as the Ribbon Slates, Eastern Slates, and Western Slates were also being worked. As quartz mining developed more and more, indicators or favorable beds were located, and while at first attention seems to have been given more to the slate beds, some sandstone beds were found to be the source of nuggety gold, and of these the Grit, Grindstone, and the Big Sandstone are typical examples.

The identification of so numerous a host of indicators had its drawbacks, and resulted in more attention being directed to the most regular gold producers and the features connected therewith. This led to the side lines being neglected, and a continuous line of mines from the Black Hill to the White Horse Ranges being opened up before the "eighties." As The Indicator was followed it was found that the richest alluvial ground on the field had been in the vicinity of it, as at the Red Streak lead, the Canadian lead, etc. Throughout its length the tracing of The Indicator was never in doubt, as the workings were continuous along it, but some of the parallel lines to the east appear to have been more typically developed locally. Of these the Pencil Mark and the Black Seam were very conspicuous when exposed in the shallow levels in the vicinity of the Llanberris and Speedwell mines, but their colour was less distinct in the mines to the north and to the south. In the workings below water level the Black Seam was not noticeable, although the slate bed continued as Dunk's Slate. Owing to the presence of a syncline this bed does not reach to any great depth in the mines north of the Speedwell.

Where best exposed The Indicator is a very narrow bed, rarely attaining a thickness of one-eighth of an inch, and occurring in a highly folded and faulted strata, is remarkable for its continuity. That The Indicator was merely a thin bed was always accepted, but the presence of pyrites at times in large proportion caused the main feature to be regarded as a pyrite seam. The existence of pyrites throughout the field is widespread, and does not appear to be confined to the gold-bearing portions. It is evident that certain slates have allowed for a more ready precipitation of pyrites, and the presence of fracture lines, cleavage and other planes, on which

films or layers are deposited, is a common feature. The identification of pyrites as an essential part of The Indicator, led to the regarding of all pyrite seams as indicators. This was a retrograde step as the pyritization of the field is not regular, and the pyrite seams are all local. Whether this is due to the presence or absence of mineralized solutions, or the presence or absence of precipitating media cannot be definitely settled. Although the miners and managers best acquainted with the line always look for the indicator slate, more or less pyrites is usually present, occurring in marked contrast with the adjacent beds, but a continuous layer or seam of pyrites rarely occurs. Another feature present at times, as seen in the workings at the 700 ft. to 1,000 ft. levels in the Woah Hawp Canton mine, is the occurrenee of a thin film or layer of quartz along the bedding plane of the Indicator Slate. This quartz film contains pyrites.

Wherever found the indicator slate conforms to the bedding. At times the pyrites may be found irregularly distributed, even approaching parallelism to the cleavage planes as is prominent at times in the larger slate beds. Chloritic and dolomitic segregations cross the slate more or less diagonally. Thinning out of the slate by pressure is frequently noticeable, and at times only a slip surface is traceable. This feature is identical to the true slides, or piths, which are situated to the west of The Indicator, and have a later origin than the quartz veins.

As to the deposition of nuggets at the intersection of the Indicator slate and quartz veins little evidence was available during the progress of the survey. The only mine in which quartz veins carrying gold were being worked was the Woah Hawp Canton. At this mine in the 740 ft. level an almost continuous ragged run of gold was deposited along the upper edge of a quartz vein in contact with The Indicator. This run of gold adhered firmly to the slate and quartz. In a larger quartz vein some 60 ft. below, the gold was coarse and irregularly distributed, being found as nuggets in the centre of a body of quartz at times 6 ft. wide. In this case the relation of The Indicator and the nuggets was obscure. A noticeable feature, however, throughout this run of gold was that so long as The Indicator and its associated beds dipped to the east, or were vertical, the gold in the quartz veins continued, but when the dip inclined to the west gold was not present in the quartz veins.

According to the evidence available the features of The Indicator are at best only a development of a wide-spread phenomena that is noticed in the parallel strata while forming the eastern limb of the anticline. Neither on The Indicator nor on the adjacent slates is any payable gold recorded on the western dip, and on the parallel lines of the Sulieman Pasha and Old Post Office Hill to the west and east of the Britannia shaft at the 720 ft. level, and 60 feet west of the Victoria United shaft, the feature is again developed in the eastern dipping beds.

The only feature in which The Indicator Slate differs from the adjoining slates is in the character of its pyrites, only cubical iron pyrites being observed on this line throughout the field, while on the parallel slates the pyrites is at times chiefly arsenical, but this varies in different parts of the field.

The pyritic seams in the adjacent slates could not be classed as identical with The Indicator chiefly owing to the fact that in the larger slates the deposition was less regular, sometimes conforming to the bedding, and sometimes to the cleavage or slip surfaces. At times the deposition was irregular, the growth of pyrites being subsequent to the cleavage of the slates, as was evidenced by the included slate fragments in some of the wider seams. Chloritic seams usually associated with pyrite, dolomite, and less commonly quartz occur in the slates, but these are usually considered an indication of poorness.

No definite feature, excepting the width of the slates, can be ascribed to such belts as the Blocky, Nuggety, 4 ft., 7 ft., 12 ft., Duchess, and Dunk's Slate, while the Streaky Slates and Telegraph Slates are commonly recognisable by the presence of vertical quartz veins. The Western Indicator in the New Normanby and North Woah Hawp mines is at times a well-marked mineral seam, but in the Llanberris No. 1 mine and the Last Chance mine the pyrites (arsenical) is scattered throughout the slate bed which contains the mineral seam of the southern mines. The various slate layers in the Big Sandstone of the North Woah Hawp and New Normanby mines possess no feature differing from the neighbouring slates, but when intersected by quartz spurs the latter are usually found to be enriched.

Reference to these favorable beds will be found in the details of the various mine workings.

## CONTINUITY OF INDICATOR, ETC.

Though the term "Indicator" might be applied to the whole of the east-dipping strata in the Ballarat East belt, it is usually restricted to the one bed, the adjacent lines being referred to as east or west of it. The Indicator as traced out in 1886 was shown in plan by Simpson[1]. Later Lidgey[2] correlated the various mine workings and traced The Indicator for a length of 2½ miles. Lidgey shows various cross-sections of the field and the correct relationship of The Indicator to the folding, but he does not suggest the extension beyond the folds.

The results of the present survey have been to prove that the downward continuation of The Indicator is limited by the proximity of a synclinal fold which lists towards it, and around which the bed conforms. The depth reached by The Indicator in the various mines opposite their respective shafts is:—

| Name of Mine. | Depth in Feet. |
|---|---|
| Victoria United .. .. | 750 |
| Britannia United .. .. | 1,030 |
| Last Chance .. .. | 1,000 |
| Llanberris No. 1 .. .. | 1,120 |
| Llanberris No. 2 .. .. | 1,320 |
| New Normanby .. .. | 1,380 |
| Woah Hawp Canton .. .. | 1,230 on a minor syncline only |

In the latter mine a section of the 1,204-ft. level shows The Indicator repeated three times. (See Fig. 65, p. 246.)

In strike the parallelism of The Indicator with the adjacent beds is apparent, and while

[1] Simpson, P. Plan showing Lines of Quartz Reef, Alluvial Workings and Leads, White Horse Ranges. Rept. Mining Reg. Vict., 30th Sept., 1886.

[2] Lidgey, E. Report on the Ballarat East portion of the Ballarat Goldfield. Special Report, Dept. Mines, 1894.

maintaining a general course of magnetic north and south, the effect of torsional strains, causing the dip to change from east to west, and block faulting, gives the average bearing in the respective mines as follows:—

| Name of Mine. | Bearing. |
|---|---|
| Victoria United .. .. | N 4° W. |
| Llanberris No. 1 .. .. | North |
| Llanberris No. 2 .. .. | N. 4° W. |
| New Normanby .. .. | N. 1° W. |
| North Woah Hawp .. .. | N. 4° E. |
| Woah Hawp Canton .. .. | N. 4° E. |

As mentioned above, the whole of the strata on the eastern limb of the anticline constitute the gold-bearing portion of the Ballarat East field, and in these strata The Indicator forms close to the syncline. This accounts for the non-presence of the Pencil Mark, Black Seam, and Eastern Indicator at a depth in the various mines.

Efforts to correlate the slates or sandstones eastward from The Indicator without regard to the folding have led to the belief that these lines have died out. Westwards from The Indicator the continuity of the beds is noticeable, but the pyrite seams are not present at all times, for example, the New Indicator and Western Indicator of the North Normanby mine occur as prominent mineral seams in this and the North Woah Hawp mines, while in the Llanberris and Last Chance mines the bed of slate continues with pyrite seams rarely present.

In the accounts of the various mine workings references are made to the various beds and indicators which were worked. Owing to the want of regularity of the gold occurrences operations now are rarely confined to one belt, but to the larger ore bodies where bulk crushings are available.

As the character of The Indicator has raised much controversy, the various descriptions of previous observers may be here cited. The first recorded account I have been able to find is by Krause[1], who mentions "a band of black pyritous slate, the so-called indicator vein. . . . At the intersection of The Indicator and the flat veins heavy masses of gold of secondary production were found deposited on the quartz floors."

Withers[2] says "the indicator is a black pyritous vertical line in the slate rock, striking, like the other lodes, north and south, thin as the edge of a knife at times, at others thickening to some inches, sometimes lost by cross-course throws east or west as all the lodes are, but always rich in itself, in gold or indicating golden riches in the contiguous quartz, and always keeping, as do the lodes as a whole, the north and south strike. Other lines rich in pyrites and of similar features indicative of the presence of gold, exist both in the eastern and western belt of lodes, but the one especially known as The Indicator passes through the eastern half of the Llanberris mine."

Johnson[3] states The Indicator is an extremely thin, nearly vertical, pyritous sheet encased in unaltered, or but slightly altered, slate in non-fossiliferous Lower Silurian. Lidgey[4] says "these indicators are usually thin beds of dark-coloured shales and slates formed of a carbonaceous mud containing a large percentage of iron sulphide. 'The Indicator' is a narrow bed of dark slate, usually showing cleavage lines, and containing a large percentage of pyrites distributed irregularly through it. This narrow bed of slate sometimes divides into two or more beds. The full width of these beds will rarely exceed half-an-inch. In other places again, the carbonaceous matter is entirely replaced by pyrites forming a narrow shining bed of cubical crystals."

According to W. Bradford[1]: "They are in most places main fissures which have occurred in the line of a porous layer of strata. There has been usually a slight sliding movement between their walls, and there is no mistaking the fact that they have been, and are, main channels for the passage of mineralized waters, and that wherever replacement or other action has succeeded in getting the walls apart, quartz has been stored as in other lode lines."

T. A. Rickard states[2] "that 'The Indicator' conforms to the bedding, and consists of a thin seam of black slate. The thickness of 'The Indicator' varies; so does its composition. It is about 1/16th of an inch, and carries pyrites and crushed black slaty material . . . at the same level it contains a small seam of quartz. In an adjoining mine—the Prince Regent—it is ¼ inch thick, and carries pyrite and black clay . . . . 'The Indicator' may be considered as a bedded vein, in that it follows the stratification. It is probable that this thin seam of black slate of which 'The Indicator' consists represents a layer of fine silt full of the remnants of vegetable life, which was laid down upon the floor of the Silurian Sea."

Most of the above views concern the main Indicator, and are largely irrespective of the similar formations parallel to it; although, as recorded by Lidgey[3], "other indicators have been recognised and named from some peculiarity connected with them." In the majority of these indicators a slate bed plays the essential part, but sometimes the auriferous portions of the intersecting veins are determined by the occurrence of sandstone strata.

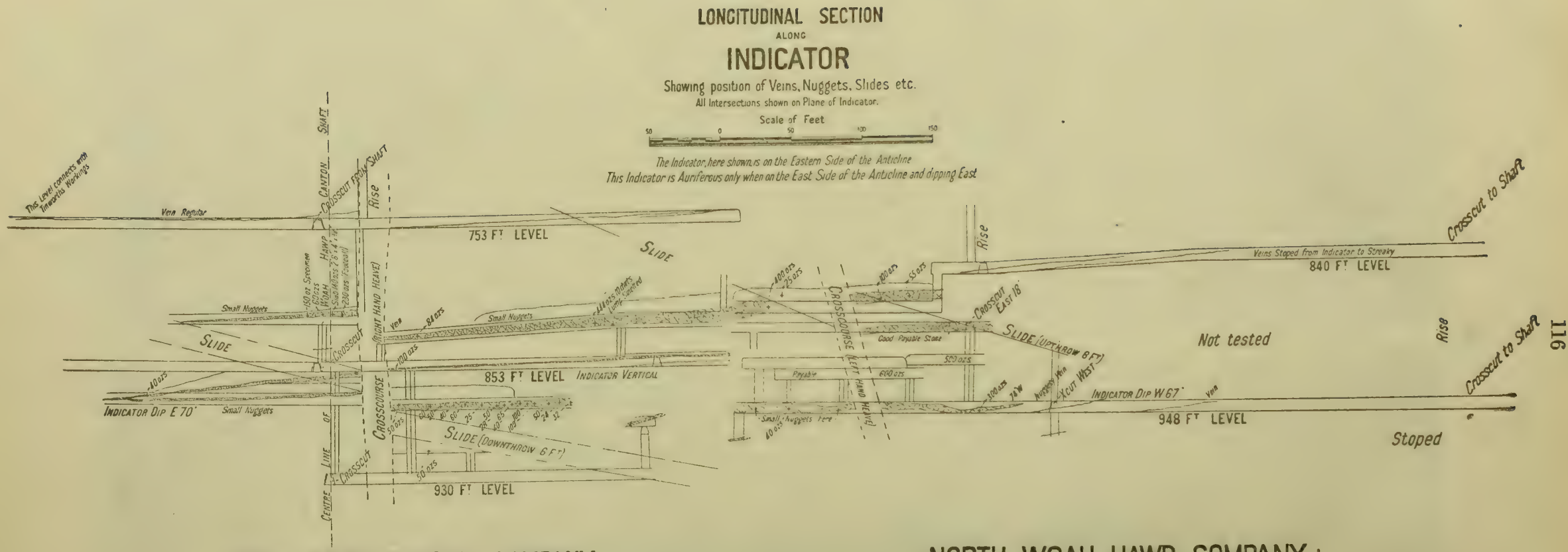
Reviewing the opinions cited above, it is apparent that Krause, Lidgey, Withers, and Rickard considered The Indicator to be a thin black slate conformable with the other beds, and containing pyrites. The late Mr. F. D. Johnson and W. Bradford hold slightly different views, but as personally explained to me by the former, the reference to the pyritous layer alone and not to the enclosing slate was an oversight on his part rather than an intentional omission, and the original samples described by him at the time were shown to me in support of his contention.

Bradford's view of The Indicator hinges solely on the pyrite, which he considers as "mineral segregation in main fissures," and he regards the Indicators as "separate and defined lode tracks in the side of an immense synclinal or anticlinal in the strata of the field."

Professor J. W. Gregory, after an examination of the Ballarat field was of opinion that "the indicators are not interstratified beds, but, as had been maintained by Mr. William Bradford of Ballarat, they cross the bedding plains irregularly. They are secondary in origin, and, although they are limited to particular bands of

[1] Krause, F. M. *The Sedimentary Rocks of the Ballarat District.*—Ann. Rep. School of Mines, Ballarat, 1886.
[2] Withers, W. B. *The History of Ballarat*, p. 344.
[3] Johnson, F. *A Study of some Ore Deposits.* Trans. Aust. Inst. Min., Eng., vol. 1, 1894, pp. 28–31.
[4] Lidgey, E. Report on the Ballarat East portion of the Ballarat Gold Field. Spec. Rept., Dept. of Mines, 1894.

[1] W. Bradford. *The Ballarat Field*, p. 17. Ballarat, 1895.
[2] T. A. Rickard. *Aust. Mining Standard*, vol. IX (1895), p. 487.
[3] E. Lidgey. *Trans.-Aust. Inst. Min. Eng.*, vol. IV, p. 15.




NOTE–
Sites of Nuggets below 25 Ounces not recorded.
Estimated Weights given in each case.

Fig. 24.

slate, they do not occupy uniform positions in these bands. . . . the indicators are seams of secondary minerals, generally chlorites, developed along slip bands traversing the slates."[1]

He recorded three distinct types of structures after microscopic examination.[1] "Some of them are thin seams of pyrites, but most of the specimens . . . are thin chloritic bands . . . specimens of what is called, especially 'The Indicator,' include both types. The 'Mineral Seam,' the 'Black Seam,' and the 'Mundic Grit' are always, so far as I have examined them microscopically, pyritic seams. All the specimens which I have examined microscopically of the 'Western Indicator,' 'Double Indicator,' and 'Britannia United Indicator' are chloritic bands. The 'Pencil Mark' represents a third type formed of a band made black by the abundance of rutile needles. Both types of indicators are secondary structures, *i.e.*, they have been formed after the formation of the rocks which contain them. . . This fact is shown by their sometimes passing obliquely across the rock band in which they occur. . . as the layers of slate are often only a few inches thick. It is natural that 'The Indicator' should run for some distance parallel to the surface of the band in which it occurs. . . The Indicators, at intervals, leave their parallel course along the bedding planes, pass obliquely across the slate bands, and sometimes cross from one bed to another."

Professor Gregory's observations introduce a new aspect of the question, and the view of previous writers may be compared. Lidgey's view was that the indicators are essentially beds containing carbonaceous matter and pyrites. This view was supported by Withers, Krause and Rickard, but Gregory states that the black colour is due to rutile in the only case he cites. Gregory's view of a secondary structure being the essential feature of the indicator is somewhat allied to Bradford's fissure theory, but the deposition of chlorite is alone referred to, no case of quartz deposition being cited, or any development of a pyrite seam. Gregory's chief arguments against the commonly accepted idea of the indicator being a bed are:—

(*a*) That the indicators are not parallel to the strata, but pass obliquely across the slate bands, and sometimes cross from one bed to another.

(*b*) It has been formed along a crack, and the chlorite has been formed for a short distance from it, along the cleavage planes, on either side. The main indicator, in this specimen, is composed of similar chlorite, and is also secondary in origin. In another instance the Indicator was present as a seam of pyrites running vertically along the middle of a quartz vein. The indicator in that case was clearly not only later than the slates, but later than the quartz veins formed in the slates.

The secondary nature of the pyrites was never questioned, but the correlation of the age of The Indicator to a date subsequent to the deposition of the quartz introduces a new aspect. Further, if the deposition of the gold in The Indicator veins is due to the presence of chlorite, as Professor Gregory considers it to be, the deposition of pyrite may be ascribed to the same cause, or rather that the presence of chlorite is one stage either of independent or accompanying reaction. But while in The Indicator chlorite is present only in microscopic quantity, on parallel beds, chlorite is abundantly developed, and is regarded by the miners as a sure sign of impoverishment.

Regarding the want of parallelism to the bedding planes, the description of the microscopic sections deal largely with the development of the secondary chlorite and pyrites, which were regarded by Professor Gregory as The Indicator, quite independent of the enclosing slate. The distribution of the pyrites is at times quite irregular. Want of parallelism of particular laminae as seen in the microscopical sections of rocks, so cleaved, strained, faulted and folded as those of Ballarat East, is hardly to be wondered at, considering that hand specimens show evidence of packing, squeezing, and creasing. Examples of cutting out of beds by faults along cleavage surfaces are common and of little importance. Regarding the secondary character of The Indicator along a plane of movement, it must be admitted that such planes are favorable for the movements of precipitating solutions, and to a certain point this view is consistent with that of earlier observers. The theory that the whole of the indicators are slip bands, characterized by chlorite, and not directly ascribed to some original character of the beds to which they were formerly regarded as part, is important.

Analogous features exist in the Ballarat West field, where the black slate zone may be classed as a typical Indicator belt in a large series of non-productive strata. In the black slate zone the character of the beds is beyond question, for in the less altered upper portions of the Guiding Star belt as in the Star of the East Company's No. 2 shaft workings, graptolite and crustacean remains were obtainable. In association with the black slates similar characters to those in Ballarat East were noted, such as laminated quartz from a thread up to extensive lodes conformable to the bedding. Pyrite seams both in the black slate and in the beds adjoining it were traceable at the 1,900 ft. level of the Band and Loch mine for a distance of over 1,000 feet, and also the veins on the parallel synclines in the Star of the East Company's No. 2 shaft and the Central Plateau Company's No. 2 shaft. The relation of the black slate zone and mineral seams to the gold deposition could not be investigated, but the gold won in the Sergeants, Washington, Band of Hope and adjoining mines came from spurs intersecting this zone of strata. Reference to these beds is made in the sections published in 1887[2]. At the Geological Survey Laboratory in 1907, analyses made of one of these beds of black slate taken from the 2,080 ft. level in the Band and Loch mine gave:—

599. Carbon, 2.37 per cent.
600. Carbon, 3.92 per cent.

Tests conducted on weak gold solutions proved that these carbonaceous slates caused a precipitation of the gold contents in metallic form in the space of a few days under ordinary conditions.

[1] *The Ballarat East Goldfield.* Memoirs Geol. Surv. Vict., No. 4, 1907, p. 13.

[2] Allan, R. Crescent, Band of Hope, and other Mines. Spec. Rept. Vict. Mines Dept. 1887.

## AURIFEROUS SHOOTS AND SUGGESTIONS FOR FUTURE DEVELOPMENT.

Before offering any suggestions for the future developments of the gold-field, an attempt will be made to summarize the various proved gold-bearing formations, and afterwards to suggest where similar auriferous shoots may be expected to exist.

Even under apparently identical conditions auriferous shoots do not always recur. At such places as Ballarat West, where there are no available surface indications, and much valuable data in underground workings are for ever inaccessible, prospecting operations must be confined to known favorable positions.

At Ballarat West the auriferous quartz in the Band and Albion and the Redan mines (the Band of Hope, the Washington, &c.) was intimately associated with the black slate belt on the anticline.[1] The quartz formations in the shallow levels were chiefly spurs. At the 400-ft. to 500-ft. levels a large lode on the apex of the anticline was proved to be payable in the Band and Albion workings, but, although the quartz lode continued to the Kohinoor mine, the values died away. From the structure revealed in the deeper workings, it appears highly probable that the Band and Albion No. 7 shaft was located in a "dome," and this probably accounts for the gold occurrence. At a lower level a defined shoot of gold was cut in the west-dipping leg or Consols reef, and was worked from near the anticline in the Kohinoor Company's ground to the syncline in the Star of the East Company's mine. This shoot took a diagonal course from the anticline to the syncline, and pitched at a greater rate than either fold.

In the South Star mine the continuation of the lode was driven on for over 1,000 feet without success, but prospects of gold were obtained in spurs, none of which were of sufficient size to warrant further search. Southwards on this line any development could occur only at a great depth—below 3,000 feet, opposite the South Star shaft, and pitching 1 in 2 southerly. Very little work was carried out south of the main crosscuts by the South Star Company, as a cross-course was known to exist in that direction.

From near the apex of the dome a shoot of payable stone, having a vertical course from the anticline to the syncline, was worked by the Sir Henry Loch Company, and later by the Band and Loch Company. In the syncline the reef was large and unpayable, but rich spurs were found at its intersection with the black slates, on their eastern dip. The syncline pitched north at an angle of 1 in 3.

On the northern side of the dome the Kohinoor Company drove long levels at depths of 580 feet and 1,300 feet along a well-defined laminated, mineralized lode almost devoid of gold; a small patch at the 580-ft. level excepted. On the northerly pitch the Consols lode went underfoot at the 580-ft. level at 800 feet north of the shaft. To test this lode away from the old workings would require a new shaft sunk to a depth of from 1,000 to 2,000 feet at a point north of Urquhart-street.

On the eastern dipping "legs" no gold was met with, although these were passed through in a number of cases; further, the quartz developments on these legs were always small.

[1] See R. Allan's plans of the Ballarat mines, 1887.

On the Guiding Star line of lode the conditions were similar to those at the Consols, inasmuch as a west dipping laminated lode was worked downwards to the syncline, which occurred at a much higher level than the syncline on the Consols line (see page 107). On the line of lode the development of quartz was extensive in the Central Plateau, South Star, Star of the East, Band and Albion, and Northern Star mines, but the shoot of gold in the syncline terminated in the Star of the East mine at a point where a nearly vertical shoot of gold was worked from the old Guiding Star mine.

A small shoot on the west leg was worked in the Band and Albion No. 9 shaft, but the Northern Star Company, as well as the Band and Albion Company, drove 3,000 feet along a well-defined lode, and beyond this the Kohinoor Company also drove 1,200 feet without more than a small patch of gold being found in the 580-ft. level. Taking the existence of the nuggetty gold in the Kohinoor and Cosmopolitan claims into consideration, rich stone must have been denuded in the northern part of this line, but the lengthy drives failed to locate any.

At the southern end, in the Central Plateau mine, the lode in the syncline was very small and not payable, and rising rapidly, so that the lode in the syncline would reach the surface of the bedrock. With a change in pitch observed on this line in the Sebastopol Plateau No. 1, the lode should again form, but a rise of 120 feet above the 900-ft. level of the Sebastopol Plateau No. 1 mine failed to locate any quartz. Whether any gold will be found in the syncline when pitching south is a problem still to be solved.

Eastwards from the Guiding Star syncline, in the Sebastopol Plateau No. 1 mine, a west dipping leg, known as the Phœnix reef, was met. This formation, the only one proved in the western field apart from the black slate zone, was met with on a horizon 300 feet stratigraphically above the lowest black slate. A payable shoot of stone was worked from the syncline to a height of 100 feet. This syncline pitched north, but the gold values do not appear to have extended below a depth of 300 feet, nor has the formation been located below that point. Southwards the reef was worked up to the alluvial. In the syncline, at 90 feet below the Phœnix reef, an inverted saddle (Fig. 33) was driven on north and south, but nothing of value was proved. On the anticline, west of this syncline, the black slate is exposed; on the lower slate well-defined legs occur, and a rise was put up in the anticline and the apex proved, but neither here nor on the west dipping leg, which was followed for a total of 1,400 feet, and ranged from 1 foot to 15 feet wide, was any gold located, although a small patch was worked in the vicinity of the anticline at the 900-ft. level in this zone, but between the black slates.

The Albion lode was first met with in the alluvial workings of the Albion Company, and the Star of the East Company, by cross-cutting west at the 1,500-ft. level, cut a lode associated with the black slates carrying payable gold, on which a vertical shoot was worked to a height of 800 feet. The characters of this lode are identical with those of the Guiding Star and Consols, and the quartz is highly laminated, hard and mineralized. South of this shoot the lode was small. The Central Plateau Company, at their No. 2 shaft, at a depth of 600 feet, met the black slate zone, and on driving along a small track of laminated stone

intersected a make of auriferous quartz spurs up to 15 feet wide, which extended for a length of 300 feet by a maximum height of 100 feet; above and below this but little quartz exists. The southern continuation of this belt of black slate was tested by the Sebastopol Plateau No. 1 Company, but no gold was met with.

In the Prince of Wales mine, when working the alluvial, in 1864, the cap of an auriferous shoot was struck and followed by levels to a depth of 600 feet. This shoot pitched to the south; the Prince of Wales and Bonshaw Companies worked the extension of the shoot to a depth of 1,300 feet, the southern pitch still continuing. The other parallel western formation, 100 feet distant, was also payably auriferous in part.

Reviewing then these three lines of lode—the Consols, Guiding Star, and Albion, or Prince of Wales—it is apparent that the following shoots were worked:—On the Consols, a vertical, a south pitching and a north pitching shoot; on the Guiding Star, a north pitching and two vertical shoots; on the Albion, a vertical, a horizontal, and a south pitching shoot; while on the Phœnix a north pitching shoot alone was met with. Seeing that their shoots were confined to similar strata under similar conditions, the diverse inclinations of the shoots is not explainable from the evidence available. Furthermore, in the case of the Consols line, the vertical shoot of the Sir Henry Loch Company extended from the syncline, at the 2,080-ft. level, to the anticline, at the 500-ft. level, while on the Guiding Star line the Guiding Star shoot was proved from the syncline to the surface. In the case of the Consols lode, the shoot formed on the west side of the anticline, and from the apex a short distance on the west leg, while on the Guiding Star line the north pitching shoot formed in the syncline, and only extended a short distance up the west leg, with the exception of the Guiding Star shoot. Observations on the Albion lode of the shoot proved in the Star of the East Company revealed a nearly vertical shoot composed of a series of almost horizontal quartz makes with attenuated portions between, and, so far as proved, no north or south pitching extension.

Apart from the well-defined lodes of Ballarat West, a small amount of gold has been obtained from spurs which do not appear to be confined to any definite horizon. Of such formations mention may be made of some low-grade formations worked by the Sebastopol Plateau No. 1 Company above the 278-ft. level in east dipping strata west of the syncline, on which the Phœnix lode formed at a higher stratigraphical position. These spurs were irregular, and yielded at times up to 3 dwt. to the ton, but, on the whole, they were unprofitable. In the Central Plateau mine, at the 1,100-ft. level, and at a similar level in the South Star mine, spurs associated with the east dipping strata, and about 100 feet below the black slate zone, were at times payable. In the Star of the East mine, at a depth of 2,200 feet and 2,260 feet, a spur was worked for a width of 70 feet on the west side of the Guiding Star syncline, and though of low grade—3 to 4 dwt.—it was profitable for a time. In the Ballarat Prospecting Company's mine, at the 340-ft. level, a spur, carrying gold in up to half-an-ounce specimens, was intersected in the east cross-cut, but did not extend in either direction. The relation of this stratum to the black slate zone was not established.

In the Township reef workings, north of Sturt-street, spurs were mined, but the extension of these by the Ballarat City Company could not be found. In the vicinity of the old cemetery various auriferous spurs have at times been located, while to the westward these were mined in Cardigan-street to a depth of 100 feet. North-west of the cemetery the Chambers Freehold Company mined an auriferous spur at a depth of 100 feet, but failed to locate others at the 200-ft. level. In the neighbourhood of the Show Yards small spurs have at times been tested, but never proved to any extent.

From the irregular distribution of these, and the comparatively low grade of the whole of them, they are of little value to mining operations, but it is probable the denudation of thousands of feet of strata containing such spurs contributed to portion of the alluvial gold, the source of which otherwise is difficult to account for.

What has generally been regarded as a line of reef, but of which information is scanty, lies in the vicinity of Ripon-street, where, from the Band and Albion Company's No. 4 shaft to the Sir William Don Company's shaft, rich alluvial was worked to the cap of a quartz formation.

In the Sir William Don the formation was classed as a spur (see page 97). The Band and Albion Company sunk their No. 4 shaft to a depth of 600 feet, but the lode proved valueless (see page 79). This formation is in the vicinity of the granitic dyke, which, while not proved to be auriferous, is closely associated with rich reef wash and gutters throughout its course.

## FUTURE DEVELOPMENTS.

Ballarat West Field.—The future development of the Ballarat West field lies more in the extension of operations into new country than in search for the downward or other continuation of the proved shoots.

The Consols lode, on its nothern pitch, so far has not yielded any indication to justify further search, unless at a great depth, and to the north of Urquhart-street; south the pitch being rapid, the sinking would be still greater. Although the operations of the South Star Company were not as exhaustive or complete as desired, but little indication of auriferous country was revealed. On the Guiding Star line, the shoot being worked to the syncline practically exhausted the auriferous stone, and, with the exception of the patch in the Band and Albion No. 9 shaft, extensive driving by this company, and also by the Northern Star Company, failed to locate any further shoots, although the west dipping lode was followed. In the Kohinoor mine one small patch was met with, and the Kohinoor No. 2 shaft failed to locate any quartz of consequence, but it appears doubtful if that mine's operations were satisfactory. In this vicinity the source of the rich nuggety alluvial may be located, and from the location of the 834-oz. nugget (see p. 102) it is probable that the Kohinoor Company's No. 2 shaft workings were in a different direction to the lode that yielded this. It is probable, however, that the source of the nuggety gold may be found under conditions similar to those met with on the apex of the Consols anticline spurs in east dipping strata of the black slate zone.

The Albion lode, from its position, offers the best incentive for prospecting; the extensive reef wash of the Newington, Ballarat Freehold and other mines west of Pleasant-street, together with rich specimens in the wash, point to the existence of further shoots on its northern extension, and as two distinct shoots—the Star of the East and the Central Plateau No. 2 shaft—were located

by driving for the one met with in the alluvial clays, it appears reasonable to expect others to the northwards. South of the Central Plateau No. 2 shaft the lode channel will be intersected by the granitic dyke. Were it not for the fear of meeting heavy water in the dyke, this is a point where prospecting might be carried out to advantage.

A further field for development lies to the west of the Albion line, as, judging by the mullock of the Winters Freehold, the Park, and other alluvial companies, the black slate zone with laminated quartz is repeated in that direction. Were attention paid to the alluvial, the position of quartz reefs could be noted and prospected, but to search for these under the deep alluvial would be costly, and, with the absence of data, unsatisfactory. One reef, recorded in the alluvial plans, shows a width of 60 feet, but was not tested. The position of other lodes taken from the original mine plans is given on R. Allan's plan of Ballarat West, 1887.

Ballarat East Field.—On the Ballarat East field, notwithstanding the nature of the quartz formations, the gold shoots are more defined and persistently regular. As referred to above, the chief gold-producing belt, so far as worked, is confined to the eastern limbs of an anticline traceable throughout the whole of the mines. The gold-bearing or favorable beds have only been proved so when dipping east, and this is strikingly evident in the over-folded strata where, when the favorable beds of the eastern limbs dip west, the gold contents are invariably poorer. Following along the strike of the beds, where, owing to torsional and twisting movements, the dip varies from an easterly one to westerly, the termination of the gold shoots can be found along the change to a westerly dip, as on the leather-jacket lode at the south end of the Last Chance mine, near the boundary of the Llanberris No. 1 Company, where, about the 800-ft. level, a payable formation was worked, also on the Indicator veins, near the boundary between the Woah Hawp Canton and North Woah Hawp mines.

The termination of golden shoots on the apex of the anticline is typical in the workings of the First Chance Company (see page 214), also Dunn's lode in the Britannia, and Roberts' lode in the Llanberris No. 1 mine. Taking a broad view of the beds, the slates appear to be the more favorable for regular gold shoots, while the veins in the sandstone yield coarse crystalline gold, but are usually patchy. The Indicator slate has yielded the largest pieces of gold, but on parallel lines specimens of upwards of 100 oz. have been obtained, and if the value of the veins throughout worked on the Indicator be compared with the adjacent lines, the average value of the quartz will be little if any above it.

In age, the auriferous veins appear to range from a very early until a comparatively recent date. Taking the main lodes or leather-jacket bodies along the so-called "slides" of the miners, these have formed subsequent to the faulting and fissuring of the strata, the broken fragments being partly enclosed in and partly replaced by metasomatic quartz. The gold-bearing solutions, while possibly under free access to the whole of the adjacent beds, along the fault lines, have favoured certain points for deposition, and this holds, not only for the gold contents, but the sulphides as well. Nor is the gold confined to quartz, but at times the dolomitic edgings of the veins and lodes carry gold. No influence on the values of the quartz can be ascribed to the north and south felsitic dykes in general, with the exception, possibly, of the Woah Hawp No. 1 mine, at the 1,100-ft. level, but there the intersection may be only a coincidence. The veins worked on the Yorkshire dyke are more intimately associated with the dyke, but evidence of the value is now not available.

An enrichment of the values of the veins is apparent in the vicinity of the cross-courses, and this is noticeable also in cases where the lava dykes follow the cross-course channel, but the presence or absence of lava may not be important. Thus, in the vicinity of a faulted block of country, the Woah Hawp Canton Company obtained rich stone on The Indicator. The North Woah Hawp Company, near the same faults on the Western Indicator, had some exceptionally rich stone (Fig. 24). In the New Normanby mine, near the dyke cross-course, the veins on the north side were much richer than to the south. In the Victoria United mine a similar result was noticed on the north side of the dyke cross-course 250 feet north from the main cross-cut. This enrichment of values appears at times to be limited to one side of the fault, and would ascribe a later date to the gold enrichment than the final stages of the fault action. A similar effect is pronounced along the "pith" or true slides where slipping on the bedding planes has produced a faulting of the quartz veins in the Victoria United, Britannia, First Chance, or on similar faults known as "flucan" and "greasy head" country in the New Normanby and North Woah Hawp mines. The amount of displacement along the pith or flucan is usually small, seldom amounting to more than 2 or 3 feet, but the gold contents of the various veins are usually enriched for a few inches on either side of the fault, although it frequently happens that where small nuggets are cut through by the "piths," a slickensided film of gold shows along the break. That under exactly similar conditions the auriferous formations on the Sulieman Pasha line, in the Sulieman Pasha and Old Post Office Hill, the Eastern Star Extended mines (see pp. 142 and 161) were found there is no doubt, and on a repetition of the same strata that formed the gold-bearing beds of the Indicator line. Eastwards from the Indicator belt the parallel field has not been prospected except by the Countess mine in 1870; the greater part of this line is hidden under the alluvial of One Eye Gully. In the Victoria United at a depth of 1,300 feet, in the Britannia at the 720-ft. level east cross-cut, and in the Last Chance mine from the 800 to 1,200-ft. levels, auriferous stone has been revealed on this anticline or to the east of it.

To summarize the conditions existing, the first essential is the formation of faults or fissures along which lodes or veins form and to which gold-bearing solutions have had access. The various beds, under certain conditions, have caused a deposition of the gold contents, and this deposition is more pronounced in the vicinity of faults mostly of an age more recent than the veins. Although on the Indicator a more concentrated deposition of the gold has occurred, the other adjacent slates, &c., have caused a similar effect.

Future developments of the Ballarat East field lie in the following of the favorable belt of country to a greater depth, and from the indications in the western cross-cut off the south drive at the 1,487-ft. level in the New Normanby mine, the

deepest strata yet revealed are still of a favorable character, and while The Indicator and surrounding beds reach the syncline and fold up, before the lowest beds yet proved have reached the syncline, a depth of several thousand feet will be attained. So far as the recurrence of the leather-jacket faults, which "breed" the quartz, is concerned, there appears no reason to suspect that these will not exist, and the deepest workings show an abundance of quartz. The only limit, then, to profitable mining will lie in the ability or otherwise of the miners to secure payable stone at a minimum of expense of prospecting.

The northern extension of the mines offers inducement, as in the case of the Black Hill Company's mine only one formation was worked, and where lower, and so far untried, parallel bodies await location.

Southwards from the Woah Hawp Canton to the Prince Regent cross-course, The Indicator and western beds below a depth of 750 feet are untried. South of the Prince Regent cross-course the workings are shallow, 600 feet at the Reward mine, and operations were largely confined to The Indicator and immediate vicinity, while the large lodes have not been proved.

On the Sulieman Pasha line, south of the Llanberris No. 3 mine, where operations reached a depth of 600 feet, only a little work has been done.

At the North Prince Extended mine veins worth 14 dwt. to the ton were left underfoot. Further prospecting on this line of country may reveal other bodies similar to that worked in the Sulieman Pasha mine.

On the Eastern line much prospecting might easily be carried on from the existing shafts, *e.g.*, in the Victoria United, Britannia United, and Last Chance Companies, and the repetition of The Indicator belt there may prove productive.

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## DEFUNCT QUARTZ MINING COMPANIES.

### BALLARAT EAST COMPANY.

This company, which was formed in 1860, sank a shaft on what was later known as the Sovereign Hill. By the end of the year 1860 the shaft was 160 feet in depth. At 90 feet a reef was found, and proved to yield 4 dwt. of gold per ton. At the 150-ft. level a cross-cut east was put out, but the results were not satisfactory, and no record of further workings are available.

### BAND OF HOPE AND ALBION CONSULS COMPANY.

During 1879, the Band and Albion Consols, which had been an alluvial mine, became almost entirely a quartz mine (see p. 80). After much prospecting, the shallow reef-washes were abandoned, and the developments of the quartz lode at Nos. 6 and 7 shafts caused a revival in mining throughout the whole of the Sebastopol field, more especially in the neighbourhood of Redan (see p. 28).

In 1880, quartz mining was in full swing. At No. 6 shaft prospecting operations at the 250-ft. level were carried out on Finn's lode, which proved to be small and, for the most part, ill-defined; 20 tons crushed yielded nearly 3 dwt. of gold to the ton. At No. 7 shaft the 350-ft. level was driven 560 feet along the lode, which had a westerly underlie of 1 foot in 3 feet; the shoot of gold-bearing stone was about 380 feet long and pitched north; the lode was upwards of 60 ft. wide near the centre of the shoot. A slide that cut off the reef in the No. 6 workings, at the 250-ft. level, was met with in the 350-ft. level north drive, No. 7 shaft. A rich pyritic vein was associated with the lode in the upper workings; this vein is analogous to the Mineral lode worked in 1906 at the Star of the East mine (see p. 175). At the 430-ft. level the lode was cut at 30 feet west of the shaft, where it was 18 ft. wide and poor. On driving north a slide was found at 90 feet; beyond this the lode was broken into a series of flat veins 2 inches to 10 inches thick, which carried payable gold over a width of 50 ft. to 60 feet. For the year 27,063 tons crushed yielded 18,770 oz. of gold.

During 1881, most of the operations were carried on at No. 7 shaft; No. 6, proving too poor, was abandoned. Stoping above the 350-ft. level was continued until the quartz "gave out" to clean country. At the 430-ft. level the north drive, after passing the slide at 90 feet from the shaft, carried payable quartz ranging from 1 ft. 6 in. to 40 ft. wide, with a well-defined footwall as far as the northern boundary at 790 feet from the shaft. Flat quartz leaders extended fully 100 feet from the footwall. At the 490-ft. level the lode was cut at 60 feet west of the shaft; at this point it was 4 ft. wide, poor, and much broken. In the north drive the lode was also poor and much broken for over 600 feet; the broken country extended 12 feet to 15 feet above the level, but above this it was well defined, large, and payable. Cross-cuts put in west proved disturbed country for a width of 60 ft. Another shaft (No. 10) was started during the year, and was connected with the 430-ft. level of No. 7 shaft. The yield of gold for 1881, 22,023 oz. from 37,672 tons, was the best obtained from the quartz workings during the mine's career.

In 1882, No. 10 shaft reached a depth of 600 feet. At 500 feet from the surface, the lode turned flatly to the west, dipping 105 feet in 90 feet perpendicular. At the 490-ft. level there was payable stone 8 ft. wide. At 90 feet below this level the lode was cut in the shaft, where it was 4 ft. 6 in. wide and dipped towards the Western lode, which was then being worked in the North Band and Barton mine. At the 540-ft. level the lode was 6 feet wide and well defined. A winze sunk at 250 feet north of the shaft proved the lode to be poor. At the 600-ft. level the lode was cut 51 feet west of the shaft; it still underlay fast to the west, was much broken up and disturbed, and carried "patches of quartz and, in places, slabs of pyrites with a little fine gold." In the drive north the lode was poor for 50 feet. In the south drive the lode was broken for 60 feet, but a well-defined body of stone 12 ft. wide then came in and extended to 125 feet from the shaft; it appeared to be "the top of a new make, opening bigger as it went underfoot." Stoping was carried out from the Nos. 7 and 10 shafts, chiefly above the 430-ft. level. The output, 46,841 tons of quartz, was the largest quantity treated in any year by the company, but the gold yield was nearly 2,000 oz. less than in the preceding year. At No. 7 shaft a prospecting cross-cut was put in east to test Finn's lode, but only small leaders were found.

In 1883, operations at Nos. 7 and 10 shafts proved large bodies of quartz that were too poor to take out. No. 10 shaft was sunk to a depth of 780 feet. At the 680-ft. level the lode was cut at 103 feet west of the shaft, and in the north drive at this depth it was 1 ft. 6 in. wide and

heavily charged with pyrites. Southwards the drive was stopped at 25 feet as the ore was unpayable. At a depth of 750 feet the shaft passed through quartz spurs; this formation was also found at 34 feet from the shaft in the west cross-cut, at the 770-ft. level, where it was 30 feet wide and carried a little gold, but it was too poor to work. A drive north 85 feet was put in. At 123 feet west from the shaft, the Consols lode-track was cut, but the quartz was small and poor. At No. 7 shaft, a new level was opened on some quartz that had been passed through in the shaft at a depth of 255 feet, but a trial crushing proved it to be poor. The gold yield for the year fell away to such an extent that the capital of the company had to be increased, so as to enable calls to be made. Tributers raised 1,247 tons of stone which yielded 440 oz. of gold, and the company crushed 6,044 tons for 1,962 oz. during the last half of the year.

The year 1884 was marked by a recovery in the position of the mine as a gold producer after the drastic falling-off in the past year. This recovery was due to a development at the 770-ft. level in No. 10 shaft, where a drive on the formation, which was cut at 34 feet west of the shaft, proved good ore at 73 feet north. A rise was started at this point, and good payable stone was followed north for over 400 feet. As this formation was in the centre of the lease, it increased the value of the mine considerably, especially as the upper or original shoot of stone was exhausted. At the 840-ft. level the lode was cut at 48 feet west of the shaft and was payable; this proved that the gold-bearing shoot pitched south. In the north drive for over 200 feet the lode averaged from 2 ft. 6 in. to 3 ft. wide, and in the south drive it opened out to 12 ft. wide at 100 feet south of the cross-cut. At the 914-ft. level, the lode was cut at 82 feet west from the shaft, and proved to be of good quality; in the north drive it tapered to 6 inches at 280 feet from the cross-cut, but in the south drive it was 3 ft. to 4 ft. wide. For a length of 470 feet the stone averaged from 2 ft. 6 in. to 3 ft. wide. The richest stone was found in the south drive. By the end of 1884, No. 10 shaft had reached a depth of 1,000 feet from the surface. At No. 7 shaft, driving and prospecting were carried on without success early in the year prior to further shaft-sinking. By the end of the year the shaft had reached a depth of 760 feet.

The discovery of the shoot of auriferous quartz enabled the company to pay off a bank liability of £3,959, and to declare dividends amounting to over £24,000. The stone crushed was of high quality, and during the last half-year it averaged nearly 18 dwt. of gold to the ton. Operations at No. 9 shaft were resumed, but owing to heavy water in the third rock, they were suspended until a pumping plant was erected.

Up to the end of January, 1885, the company had crushed in all 157,109 tons of quartz and had won 94,012 oz. of gold. Between the 30th of June, 1885, and the 30th of January, 1888, £25,818 was paid in dividends.

In 1885, the improved returns of the previous year were maintained. The bulk of the crushing material came from No. 10 shaft. The south drive at 914-ft. level was extended, and the cross-course was met with at 307 feet south of the cross-cut; the lode at this point was 14 ft. wide, but in the north drive it was small, being under 9 in. wide between 280 feet and 450 feet from the cross-cut. At the 1,000-ft. level the lode was cut at 122 feet west of the shaft where it was 3 ft. wide; the cross-course was 325 feet south and displaced the lode 75 feet in a right-hand direction. Payable quartz was driven on to the cross-course; its continuation was found beyond the break and followed for a distance of 115 feet, where a small fault displaced it 2 feet; beyond this similar quartz was driven on for 82 feet to another break, but beyond this point the lode became large and poor. At the 1,090-ft. level, the lode was cut at 164 feet from the shaft; it was 1 ft. 3 in. wide and carried a little gold. By the end of the year the north level was driven 143 feet along a reef up to 2 ft. in width, which occasionally showed a little gold, and the south drive was put in 170 feet without finding payable ore. Stoping was in full swing above the 1,090-ft. level to the backs above the 770-ft. level. The output for the year was 20,158 tons, which yielded 14,753 oz., and averaged 14 dwt. 15 gr. of gold to the ton.

No. 7 shaft reached a depth of 1,090 feet by the end of the year, and prospecting drives were put in east and west without locating payable stone. At No. 9 shaft, sinking and puddling up were in progress in the third rock.

During 1886, the sinking of Nos. 7, 9, 10, and 11 shafts was continued. No. 7 shaft attained a depth of 1,300 feet. At the 1,200-ft. level the lode was cut on the south side of the cross-course; at 78 feet from the cross-course the lode was well defined, payable, and about 3 ft. wide, but north of the cross-course it was broken and poor. The east cross-cut at the 1,200-ft. level intersected Finn's lode at 402 feet from the shaft; this reef, which averaged 6 ft. wide, was driven on south for nearly 90 feet, but several trial crushings proved the stone to be unpayable.

At No. 10 shaft, the 1,090-ft. level was extended to 566 feet south of the cross-cut, the greater part of the way through good stone 3 ft. wide. The north drive was continued to 260 feet, the last 50 feet being in a small pinched lode, broken and poor. At the 1,200-ft. level, the reef was small, broken, and poor in the drives both north and south.

At No. 9 shaft, a depth of 400 feet was reached, and a cross-cut was started easterly towards the Guiding Star line of lode.

No. 11 shaft was begun during the latter part of the year, and was 65 feet deep by the end of the year; it was in basalt the whole distance.

The yield for 1886 was nearly as large as that of the preceding year, though the tonnage of ore crushed was smaller, 13,703 tons yielding 13,733 oz., an average of a little over 1 oz. to the ton. Most of the ore came from No. 10 shaft. Dividends amounted to over £22,000, and the cost of development at Nos. 7, 9, and 11 shafts was paid. Small blocks of ore in the upper levels were worked by tributers with fairly successful results.

In 1887 the lode was intersected at the 1,300-ft. level (No. 7 shaft) at 350 feet west of the shaft, and a drive was put in southerly to the boundary of the lease. At 160 feet from the cross-cut the gold-bearing portion was found; it averaged from 2 ft. 6 in. to 3 ft. 6 in. wide, and continued to the boundary. A prospecting cross-cut put in east at the 1,300-ft. level passed through a small well-defined vertical lode-track at 95 feet from the shaft; this track was highly mineralized and carried a little gold, but very little driving on its course appears to have been done.

The 1,400-ft. level was put out along the cross-course in a south-westerly direction. A drive southerly along the lode for 180 feet failed to

locate the south-pitching shoot of payable quartz. At about 40 feet west of the Consols lode, a lode-track called the Christmas, was met with; the track had two well-defined walls, in some places from 3 ft. to 4 ft. apart, with quartz 9 in. wide on the hanging wall side, the remainder of the formation being broken country, grit and pug mineralized throughout. This track was followed north for about 60 feet during the year, but it was poor.

At No. 10 shaft, No. 13 level (1,200 ft.) was driven to 493 feet north of the shaft on the lode-track, which was 6 in. wide, and carried a little gold, but was too poor to work.

At No. 9 shaft, sinking was continued, and a depth of 880 feet was attained by the end of the year. The Guiding Star lode was cut 197 ft. east of the shaft at the 400-ft. level; a drive was put in for 100 feet on its course, and a rise was put up 100 feet, but nothing payable was disclosed. The country was much disturbed by a slide. At the 500-ft. level the lode was intersected at 167 feet east of the shaft, and drives were put in 596 feet south and 790 feet north without finding payable ore. The track varied from 1 ft. to 4 ft. wide, and carried bunches of quartz, pug, grit and broken country, highly charged with pyrites. A cross-cut was driven 400 feet west at this depth (600 ft.). At the 700-ft. level the lode was cut and proved small, carrying black pug and grit in the north drive for 30 feet. The sinking of No. 11 shaft was stopped early in the year, after a depth of about 70 feet had been reached.

The gold yield for 1887 was 15,787 oz. from 16,434 tons, a better return than had been won during any of the past four years. Dividends amounting to £25,256 were paid, as well as the cost of development work at Nos. 9 and 11 shafts.

In 1888 the whole of the payable ore between the 1,300-ft. and 1,400-ft. levels at No. 7 shaft was taken out as far as the company's southern boundary. The 1,400-ft. level was driven in hard country along a small track, and a slide appeared to form the "keel" of the shoot in the stopes above this level. A drive was put in for 740 feet north along the Christmas line. The track, which was well-defined and from 8 in. to 4 ft. wide was heavily mineralized, but was not payable. Cross-cuts about 40 feet east from this drive were put in to the Consols lode at 250 feet, 450 feet, and 600 feet north. In the middle cross-cut the Consols lode was found to be 4 ft. 6 in. wide and highly mineralized, but very poor; it did not extend to the next cross-cut north. East of the shaft at the 1,400-ft. level a cross-cut intersected a lode at 98 feet; this formation, called the Jubilee line, was about 8 in. wide, and had well-defined walls, but it was not payable. At the 1,300-ft. level a drive was put in south for 95 feet on the Jubilee lode, which varied from 8 in. to 1 ft. 6 in. in width; a trial crushing gave 5 dwt. of gold to the ton. At No. 10 shaft a little stoping between 1,100-ft. and 1,200-ft. levels was carried on during the early part of the year, until the ore was exhausted.

No. 9 shaft on the Guiding Star line reached a depth of 1,000 feet during the year. At the 1,000-ft. level a cross-cut west was put in 60 feet in search of the lode, which was dislocated by a large fault, and what was regarded as the downward continuation of the lode of the upper levels was found at 13 feet east of the shaft. At this point the lode was 6 ft. wide, but barren. At the 900-ft. level the lode was struck at 12 feet east of the shaft and driven on north for 280 feet; at 35 feet from the cross-cut payable ore was met with, and from there onwards to the face of the drive it remained payable except for a small blank caused by a break. The lode, which varied from 6 in. to 4 ft. wide, was stoped above the level. At the 800-ft. level the lode was cut at 50 feet east of the shaft, and was driven on for 107 feet north; at the 700-ft. level it was cut at 90 feet east from the shaft, and was driven on for 240 feet north; and at the 600-ft. level it was cut at 130 feet east of the shaft, and was driven on for 170 feet north. The first 40 feet of the drive at the 600-ft. level was in barren quartz, but with this exception the whole of the north drives were in good ore from 1 ft. to 6 ft. wide. The western cross-cut at the 600-ft. level was extended to 1,163 feet from the shaft. The drive north at the 500-ft. level was continued to 1,024 feet from the cross-cut without meeting any development of ore.

The output for 1888 was 15,176 tons of quartz crushed for 11,764 oz. of gold.

In 1889 the No. 11 shaft, which had reached a depth of 120 feet (including 34 feet in the second rock) at the end of the previous year, was again abandoned. At Nos. 7 and 10 shafts the output of quartz was diminishing, and prospecting operations failed to locate any further formations. The 1,400-ft. level was driven north towards the Sir Henry Loch mine, but nothing of value was discovered, and the workings were let on tribute. No. 7 shaft was sunk to a depth of 1,600 feet, and a cross-cut was started to the west. No. 9 shaft was sunk to a depth of 1,236 feet during the year. Stoping on the Guiding Star lode was continued above the 900-ft. level. At the 1,100-ft. level the lode was 7 feet east of the shaft, where poor stone, 3 ft. wide, was disclosed. Drives were put in along the course of the lode for 140 feet, and a rise was put through to the 1,000-ft. level, but nothing of value was found. The 1,000-ft. level was driven 315 feet north on a highly mineralized, but poor, lode, varying from 1 ft. to 4 ft. in width, and 166 feet south on a lode which was broken, irregular and poor. Stoping above the 900-ft. level was continued throughout the year on quartz averaging about 11 dwt. to the ton. The western cross-cut at the 600-ft. level was extended to 1,353 feet from the shaft, where a lode formation 3 ft. wide, mineralized and showing a little gold, was cut. A drive was put in for 25 feet north, but the formation remained poor. At 1,058 feet from the shaft, a drive north was put in on a formation carrying plenty of pyrites for a distance of 415 feet.

The year's output from Nos. 7 and 10 shafts was 1,439 tons for 815 oz. of gold mined by the company, and 1,522 tons for 1,114 oz. raised by tribute parties. From No. 9 shaft 6,865 tons yielded 3,749 oz. of gold.

During 1890, the western cross-cut at the 1,600-ft. level, No. 7 shaft, was put in to 338 feet but stopped before reaching the lode. From the 1,400-ft. level a winze was sunk 72 feet on a small lode in which no gold was seen. The tribute parties in the upper levels raised small parcels of payable ore, 1,818 tons yielding 1,584 oz. of gold.

At No. 9 shaft, the lode, which was small, poor, and in hard country, was 7 feet west of the shaft, at a depth of 1,230 ft. A drive north of this formation proved poor quartz for 75 feet, but then a small make of stone which showed gold freely was cut; a winze was sunk to a depth of 60 feet,

and the quartz, which varied from 2 ft. to 4 ft. wide, continued to show gold freely.

The drive was put in 475 feet during the year, and cross-cuts proved the lode to be 30 ft. wide with large blocks of sulphide throughout; the quartz was poor, but the pyrites assayed 2 oz. to the ton.

At the 1,310-ft. level the lode was reached at 30 feet west of the shaft; it had a well-defined footwall on which was a body of quartz 4 ft. wide with a little fine gold throughout. Drives were put in north and south. In the north drive, the lode widened for a distance of 125 feet, and was highly mineralized; in the south drive for 60 feet the lode was wider than the drive, and was also mineralized.

The output from No. 9 shaft in 1890 was only 334 tons, yielding 334 oz. of gold.

In 1891, the 1,600-ft. west cross-cut from No. 7 shaft intersected the Consols lode at 534 feet from the shaft. Drives were put in north and south on the course of this lode for nearly 100 feet, but the lode proved small and poor; work at this level was then discontinued, and the only operations from this shaft were those carried out by tribute parties in the upper levels.

At No. 9 shaft the 1,310-ft. level was driven 523 feet from the cross-cut to within 200 feet of the southern boundary; the lode was large, and occasionally showed a speck of coarse gold, but it was not payable. A trial crushing of 40 tons from 315 feet south of the shaft yielded 28 oz. 18 dwt., but no more ore of this quality was available. North, the drive was put in 325 feet on a highly mineralized lode. The 1,230-ft. level north was extended to 721 feet in a large mineralized body of quartz with very little free gold; trial crushings proved the pyrites to contain from 9 dwt. to 10 dwt. of gold to the ton, which would not pay the cost of mining and treating it.

The gold yield for the year fell away considerably; 2,466 tons yielding 1,120 oz. of gold, of which over 1,000 oz. was won during the first half of the year.

In 1892 a couple of tribute parties were engaged fossicking in the old stopes above the shallow levels at No. 7 shaft, but little success attended their efforts. No. 9 shaft reached a total depth of 1,622 feet, and a cross-cut at the 1,600-ft. level was put out 120 feet west. At the 1,500-ft. level, what was regarded as the footwall of the lode was cut at 125 feet, and the supposed hanging wall at 160 feet. In the drive north, only a few small veins of stone were found for 80 feet; south, the drive on the footwall proved quartz carrying mineral, and this was driven on for 139 feet. At the 1,400-ft. level the Guiding Star lode was cut at 61 feet west of the shaft; it consisted of solid quartz, heavily mineralized, 25 ft. wide, and carrying a little fine gold. The south drive was put in to 550 feet from the shaft dur- in the year; at 280 feet south, a cross-course threw the lode 60 feet to the west, and, at 530 feet from the shaft, a cross-cut west proved the lode at this point to be 30 ft. wide. A crushing of 741 tons of quartz, mostly from this drive, yielded 111 oz. 10 dwt. of gold, including that from pyrites. The tributers in No. 7 shaft obtained 54 oz. from 117 tons.

During 1893, operations were chiefly confined to Nos. 9 and 11 shafts, Nos. 7 and 10 shafts being almost abandoned. At No. 9 shaft, the south drive at the 1,400-ft. level was extended to 730 feet from the cross-cut; the lode varied from 25 ft. to 37 ft. wide, but was unpayable. At the 1,500-ft. level, the north drive was extended to 254 feet on unpayable ore, and the south drive to 179 feet from the cross-cut; from these drives 720 tons of quartz returned 115 oz. of gold. At the 1,600-ft. level a formation with an eastern underlie was found at 137 feet from the shaft, and the cross-cut was extended to a wall dipping westerly at 276 feet. Before this wall was reached, "veiny" country was passed through, some of which yielded 2 dwt. to 4 dwt. of gold to the ton, but it was generally too poor to merit further prospecting. Before the end of 1893 all quartz workings were suspended while shaft-sinking to a depth of 1,830 feet was in progress. At No. 7 shaft the tributers met with little success. No. 11 shaft was sunk from a depth of 120 feet to 183 feet during the last half of 1893.

In 1894, a few tributers fossicked in No. 7 shaft. No. 11 shaft was sunk to 246 feet, and at this depth a reef-drive put in 405 feet west passed through several quartz leaders that gave a few colours of gold in dish prospects. No. 9 shaft was sunk to a depth of 1,923 feet, and cross-cuts were put in west at the 1,800-ft. and 1,900-ft. levels during the year. The 1,900-ft. cross-cut reached 623 feet east of the shaft, and a western cross-cut was started. At the 1,800-ft. level a lode formation was found at 391 feet from the shaft; it was 29 ft. wide and consisted of alternating quartz spurs and strata. Drives were put in north and south. At 111 feet south, the formation became small and irregular, and at 130 feet north from the cross-cut a cross-course threw the lode 35 feet east; up to this cross-course the lode was poor, but north of it makes of stone ranging up to 10 ft. in width carried gold and appeared to be rising to the north.

During 1895, a few tribute parties still worked at No. 7 shaft. At No. 9 shaft the east cross-cut at the 1,900-ft. level was stopped while a beam engine pumping plant was erected and the pumps were lowered to that depth. At the 1,800-ft. level the north drive was extended 470 feet from the cross-cut. Cross-cuts at intervals of 100 feet proved the formation to be about 30 ft. wide, and a little stoping in the vicinity of the cross-cut produced 800 tons of quartz, which yielded 260 oz. of gold. At 588 feet north of the cross-cut a cross-course was found, and driving ceased.

Early in 1896 the pumping plant was started, and the mine was unwatered by the end of March. Nine hundred tons of ore from the stopes over the 1,800-ft. north level yielded 107 oz. of gold. At the 1,900-ft. level the east cross-cut passed through a mixture of slate and quartz at 722 feet from the shaft. A lode-track at 863 feet was 4 ft. wide and carried mineral and a little fine gold; it was regarded as the Christmas lode. At 879 feet from the shaft was another lode 1 ft. 4 in. wide along which drives were put in north to 303 feet and south to 97 feet before the end of the year; the quartz throughout was small and carried no gold. At 425 feet west of the shaft the cross-cut passed through a width of about 10 ft. of irregular mineralized quartz veins showing gold. At 439 feet a solid body of quartz was struck, and west of this were more veins. The cross-cut was extended to 497 feet from the shaft, where the northern cross-course was intersected and driving ceased. North drives were put in on both sides of the lode-formation for 80 feet and 150 feet, respectively, and proved extensive veins on which stoping was carried out. Two south drives were put in 50 feet and 90 feet on large

veins. 1,999 tons of ore from the north and south drives and the stopes yielded 523 oz. of gold.

In 1897, a winze 45 feet deep was put down in the south drive at the 1,900-ft. level on the Guiding Star lode. For 35 feet it passed through a strong body of quartz showing gold freely. 833 tons of quartz from the winze and the stopes over this level yielded 314 oz. of gold. The formation was very irregular, consisting of flat veins of quartz dipping east from the hanging wall with intervals of country rock, which made it difficult to work the quartz expeditiously. The south main drive was extended to 150 feet from the cross-cut, where the lode became small and poor. The available ore from the winze was taken out before the end of the year. At the 1,800-ft. level the north drive was continued through the cross-course, and the lode, which was displaced 20 feet east, was picked up, but as it was poor no further work was carried out. On the Consols line the drive north was extended to 884 feet from the cross-cut, or within 140 feet of the northern boundary. At 762 feet north of the cross-cut a cross-course threw the lode 26 feet east, and the drive was continued on the western track. At 122 feet north the two tracks appeared to join, and some quartz was found in broken country at this point.

In 1898, extensions of the drives north and south at the 1,900-ft. level on the Guiding Star lode met with no better results, and after a crushing of 345 tons had yielded only 57 oz. 10 dwt. of gold, operations here ceased. At the 1,300-ft. level work was resumed, and the north drive was extended to 450 feet from the cross-cut on an unpayable lode 25 feet wide. At 365 feet north a break filled with "black pug and loose blocks of mineral" was struck; this continued for 75 feet, where it gave way to a strong body of quartz with a little mineral on the footwall side. On the Consols lode, at the 1,900-ft. level, the north drive was extended to 984 feet, nearly to the northern boundary, on a lode 3 ft. 6 in. wide, carrying a little mineral but no gold. A winze sunk at 640 feet north of the cross-cut passed through several gold-bearing leaders.

Towards the close of 1898 the Band of Hope and Albion Consols Company amalgamated with the Sir Henry Loch United Company, and formed the Band and Loch United Company (see p. 171).

The following yields were recorded:—

| Year. | Tons Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | | oz. | dwt. | gr. |
| 1879 .. .. | 10,833 | 11,415 | 8 | 0 |
| 1880 .. .. | 27,063 | 18,770 | 3 | 0 |
| 1881 .. .. | 37,679 | 21,042 | 11 | 0 |
| 1882 .. .. | 46,841 | 20,286 | 9 | 0 |
| 1883 .. .. | 17,829 | 6,132 | 12 | 6 |
| 1884 .. .. | 16,440 | 12,919 | 11 | 12 |
| 1885 .. .. | 20,158 | 14,754 | 8 | 16 |
| 1886 .. .. | 13,703 | 13,733 | 0 | 12 |
| 1887 .. .. | 16,248 | 15,914 | 2 | 9 |
| 1888 .. .. | 14,738 | 9,933 | 4 | 3 |
| 1889 .. .. | 10,848 | 4,478 | 11 | 18 |
| 1890 .. .. | 2,197 | 1,795 | 5 | 0 |
| 1891[1] .. .. | 3,296 | 1,200 | 10 | 0 |
| 1892 .. .. | 970 | 197 | 3 | 6 |
| 1893 .. .. | 1,027 | 263 | 15 | 10 |
| 1894[2] .. .. | 662 | 55 | 6 | 8 |
| 1895 .. .. | 1,082 | 42 | 18 | 15 |
| 1896[2] .. .. | 952 | 129 | 3 | 0 |
| 1897 .. .. | 2,924 | 283 | 5 | 12 |

[1] Nine months.
[2] Six months.

BLACK HILL COMPANY.

Early in 1854 the quartz reefs at Black Hill attracted the serious attention of the prospectors. At this time the shallow alluvial mines were worked out, and the source of the gold was being looked for. The first party to install a plant to crush the quartz on the Black Hill was formed by Dr. Otway, who purchased a 4-head battery in Melbourne and had it erected on the summit of the hill. A windmill was used to drive the battery, but the results were unsatisfactory, and the returns from the quartz were lower than was anticipated. In 1855, another site—this time at the foot of the hill—was chosen, and the plant from the hill-top, together with two additional stampers and a Chilian mill, were set at work, the whole being operated by steam power. The party did not, however, remain long in occupation of the ground, which became the property of the Port Phillip Company. The Port Phillip Company carried out a considerable amount of prospecting without meeting with the success that it desired, and then abandoned the area for one further to the north. For a short time the Penrose Company held possession of the hill, but in 1859 the Black Hill Quartz Crushing Company, a party of six shareholders, purchased the plant and claims of the Penrose Company, renovated the mill of twelve stampers, and added another twelve; the 24 heads of stampers were at work prior to 1860. For a time this mill was occupied in treating *débris* from the puddling machines on the hill; this averaged 10 dwt. to 12 dwt. to the ton. Prior to 1860, about a score of small parties were at work mining quartz and having it treated at this mill.

The discovery of payable veins by "surfacers" led to thorough prospecting of the veins with which the whole hill appeared to be permeated, and quartz mining assumed a permanent aspect. By the end of 1859, the average quantity of stone treated per week was 240 tons, and the shareholders found it more profitable to mine and to crush its own quartz, which averaged 6 dwt. of gold to the ton, than to crush for the public, so that when the output from the mill was increased to 300 tons a week in 1860, and the yield had risen to 7 dwt. to the ton, crushing on hire for the public was stopped. In 1860, six companies were mining on the Black Hill (the Crocodile, the Independent, the Chisholm's, the Black Hill Quartz, and two private parties), and quartz yielding 4 dwt. to 5 dwt. of gold to the ton gave a good profit; wages were—good men, 9s.; shovellers, 8s. 4d.; boys, 5s., per day. Firewood, of which 60 tons to 70 tons a week were used by the Black Hill Company, cost 6s. per ton (50 ft.).

In 1861, when the quartz was mined from the deeper levels, the experiment of calcining the quartz before crushing was tried, but was very soon abandoned, as it was proved that the ore was in no way refractory. In August, 1861, the Black Hill Quartz Crushing Company was reorganized under the title of the Black Hill Company Limited, 240 shares of £100 each being allotted, and 60 held in reserve. Prior to reorganization the company crushed 32,000 tons of quartz, which averaged 5 dwt. 1 gr. of gold to the ton. Before the end of 1861, the newly formed company installed a battery of 60 heads of stampers, which enabled many economies to be effected, and reduced crushing costs by 4s. to 5s. per ton. This mill is still at work in its original position. A number of small claims were bought

out by the Black Hill Company, £360 being paid for Howe and party's claim of 40 feet, and £2,000 for Marley and Fisher's claim, which adjoined the property of the company on the north and extended 46 feet along the line of reefs. Marley and Fisher won gold valued at £1,300 or £1,400 in two months prior to selling the ground.

Early in 1862 the new battery was started, and the company was enabled to treat 1,000 tons of quartz a week. The ground held by the Black Hill Company Limited comprised altogether about 40 acres; it was divided into five blocks, known respectively as the Western, the Crown, the Main, the Southern, and the Northern claims, separated by small intervening blocks held by private parties. The ground was held under miner's right and Crown lease. By arrangement with the private claim-holders, the several blocks held by the company were connected by means of tunnels. At the end of 1862, the greater part of the Black Hill was held by the company. The workings consisted of open cuts and of tunnels, which now amounted to nearly half a mile in total length. In April, 1863, the Majestic Company's area was purchased. Up to May, 1863, the output of the mine from the new mill totalled 8,949 oz., valued at £35,654, from the treatment of 65,932 tons of quartz. At this date the aspect of the hill was changed, for, instead of the dark clothing of forest from which it derived its name, extensive white cliffs marked the sides of the open cut.

In 1864, the stone crushed was poor, but, as it was cheaply mined, it yielded a profit, the fortnightly return of gold varying from 120 oz. to 250 oz. The total amount crushed to the end of June, 1864, was 121,723 tons, which yielded 14,455 oz. of gold, valued at £57,782.

During 1865 a whim-shaft (6 ft. x 3 ft.) was sunk from the bottom of the open cut, and cross-cuts east and west were put in at a depth of 120 feet.

Throughout 1865 and 1866, the crushings per fortnight averaged about 800 tons, and the gold yield ranged from 100 oz. to 225 oz.

By 1867 the workings of the whim-shaft consisted of the 80-ft. and 120-ft. levels. At the 80-ft. level the quartz was struck at 75 feet from the shaft, and was followed south 280 feet, and north 580 feet, passing through a cross-course at 230 feet north of the shaft; up to this point, the reef was stoped to the cutting, and averaged 20 ft. wide. East of this formation, on the south side of the cross-course, was a second make with an easterly underlay, which tapered off both to the north and the south. A feature of the cross-course that was noted at the time was that the eastern formation appeared to be shifted east while the western body, which has a westerly underlay, appeared to be shifted west, an effect caused by a vertical movement on the cross-course. The western body of quartz was followed at the 80-ft. level to a second cross-course at about 560 feet north of the shaft; beyond this cross-course only a rubbly formation was found. At the 120-ft. level the western body ranged from 1 ft. to 8 ft. wide, and it was followed north beyond the second cross-course, and was stoped to the 80-ft. level.

During 1868, a north-westerly cross-cut driven from the shaft at a depth of 170 feet proved some of the best quartz yet seen in the mine. A smaller quantity of ore was crushed fortnightly during 1868, but dividends continued to be paid; the crushings now averaged nearly 5 dwt. to the ton, a decided improvement on results of past years. At the 170-ft. level a leader, chiefly black slate with but little quartz, about 3 in. wide, carrying gold, was followed; this was found where the richest ore was located. On sinking the shaft to a depth of 270 feet in June, 1868 (when a start was made to open out east and west), a small leader carrying gold was cut near the bottom. The lode showed a number of small veins running through black slate. Towards the close of 1868 the quartz lodes showed signs of becoming worked out, and a scheme of vigorous prospecting was resorted to, but without success.

Early in 1869, as the yield from the stopes was unprofitable, the shaft was sunk to a depth of 370 feet from the floor of the cutting, making the total depth 460 feet from the surface. In the last 100 feet, several small gold-bearing veins were passed through. For the first half of the year 1869 the average value of the stone crushed was 3 dwt. 11 gr. to the ton, 9,584 tons being treated for a yield of 1,674 oz. of gold. By the end of the year 1869 the shaft was sunk 470 feet from the sill, or 560 feet below the original surface of the hill, and at this depth cross-cutting east was begun.

In April, 1870, the mine was let on tribute, as the returns were falling off and the veins were small.

In 1871, a shaft was sunk on the flat, and rich ore was found at a depth of 50 feet. By the end of the year the shaft was 100 feet deep, and the returns from this level were as good as those from 50 feet.

During 1872 the value of the stone crushed increased to nearly half-an-ounce of gold to the ton. A shaft was opened on the hillside, and a gold-bearing formation was struck at 50 feet from the surface. For the last six months of the year a sum of £992 was paid in dividends.

In 1873 the shaft on the flat was sunk to a depth of 320 feet. At the 270-ft. level rich ore was found, but the yields were decreasing, and towards the end of the year the tonnage fell away materially.

In 1874 a second shaft (later known as No. 1) was sunk on the flat to a depth of 308 feet, and early in 1875 machinery was installed. By the end of the year a depth of 545 feet was reached, and early in 1876 cross-cuts at 600 ft. from the surface were driven west 72 feet and east 150 feet, and several small formations were cut. At the No. 1 tribute shaft the tributers attained a depth of 400 feet in 1874, and located payable stone at this level.

In 1875 the shaft in the cutting reached a depth of 530 ft. Prospecting shafts were now sunk on the Devil's Point line of reef, and payable stone from 2 ft. to 6 ft. wide was located by tributers. Towards the end of 1875 stone averaging 13 dwt. to the ton was being won from the main shaft on the flat. At this date the drive on the lode at the shaft in the cutting was in a total distance of 351 feet north, with poor quartz 5 ft. wide in the face, while at the 380-ft. level the lode was 4 ft. wide and poor.

In 1877 two tribute parties working to a depth of 150 feet at Devil's Point took out ore averaging 5 dwt. of gold to the ton. At the main shaft on the flat various tribute parties endeavoured to locate the veins opened by the United Black Hill Company, and with this object put up a rise from the 490-ft. level. At this date six tribute parties had shafts within the claim, three being on the main line and three on the Devil's Point. Seven

thousand tons crushed during the year averaged about 5 dwt. of gold to the ton.

In 1878 operations at the main shaft opened up payable ore to the east of the Indicator slate, and for the last half-year 1,020 tons yielded 644 oz. of gold. On the Devil's Point line, No. 3 shaft reached a depth of 235 feet. Various other tribute parties were at work on the lease.

In 1879 the eastern slates were worked with profitable results from No. 1 shaft at the 400-ft., 500-ft., and 600-ft. levels, a large body of payable ore being in sight. This development led to the formation of the Queen Company, which leased No. 1 shaft and workings on tribute from the Black Hill Company (see p. 150). The tribute parties, now a dozen, worked at shallow levels on the lease, and raised over 7,000 tons of quartz, which yielded 2,500 oz. of gold.

During 1880 the results from the Queen Company led to the formation of several tribute parties into companies, known as the No. 2 Queen, the North Queen, and Finlayson's Queen. At Devil's Point a depth of 338 feet was reached, and at the 331 ft. 6 in. level gold-bearing veins were struck.

By the end of 1881 the tribute parties were in the following positions:—

| Name. | Depth of Shaft. | Remarks. |
|---|---|---|
| Queen Company .. | 652 ft. 6 in. | Driving and stoping on plenty of stone |
| Queen No. 2 Company | 480 ft. | Prospecting |
| Queen North Company | 337 ft. | Prospecting |
| Finlayson's Queen Company | 530 ft. | Cross-cutting at the 420-ft. and 520-ft. levels |

The yield from the lease for the year was 4,110 oz. of gold from 11,256 tons crushed.

In 1883 the Queen shaft was deepened to 712 feet, and a chamber was cut at this depth; while at the 660-ft. level a cross-cut was put in 233 feet, and a rise was put up on the Indicator. The Queen tribute party relinquished this ground, and the Black Hill Company took possession. The Young tribute party at No. 2 shaft also ceased operations after sinking to a depth of 480 feet on the Majestic line of lode. No. 3 shaft on the Sulieman Pasha line was sunk to a depth of 331 feet, but the lode proved unpayable.

During 1884 the quantity of available ore fell away considerably, and many of the tribute parties gave up their areas. At the main shaft a depth of 750 feet was reached, and a cross-cut east at 740 feet was started. At the 500-ft. level of the Queen shaft the cross-cut west was extended to 990 feet from the shaft, without payable result. A drive south on the Sulieman line gave favourable indications. At 200 feet and 300 feet from the surface prospecting was in progress.

Throughout 1885 the west cross-cut at the 740-ft. level was extended to the Indicator slate, where quartz veins carrying gold in small quantities were proved. Operations in the deeper levels were abandoned in July, and work was confined to the upper levels. Payable veins were worked at the 400-ft. level. At the 300-ft. level a drive north from the west cross-cut opened up a large body of gold-bearing stone, while at the 200-ft. level a payable lode was intersected at 150 feet west of the shaft. At the 500-ft. level prospecting on the eastern slates was carried on, but the results were not satisfactory. The No. 3 or West Queen shaft on Devil's Point was repaired and let on tribute. At the 235-ft. level a considerable amount of payable ore was opened up north of the cross-cut. The water-level throughout the lease having been reduced by the operations at the main shaft, from ten to twelve tribute parties were engaged in working at shallow levels.

In 1886, on account of the development of the Sulieman Pasha line of reef by the West Queen party of tributers at No. 3 shaft, the parent company extended a cross-cut west at the 300-ft. level from the main shaft to intersect the lode south of the tribute block. The North Queen tribute struck a vein carrying payable gold at the 337-ft. level. In November, 1886, the Queen's Jubilee Company acquired the Old Queen or main shaft.

During 1887 and early in 1888 the Queen's Jubilee Company deepened its shaft to 850 feet, and cross-cut east and west at a depth of 840 feet to test the stone which had been intersected by a diamond drill, and then suspended operations. On the Sulieman Pasha line, the Sulieman Pasha Consols Company (formed in July, 1887) drove north at the 331-ft. level of its main shaft (now 409 feet deep) under the shoot of payable ore worked by the West Queen tribute party. The North Sulieman Pasha Company, which was also a tribute block from the Black Hill Company, floated during the 1887 boom, sank its shaft to a depth of 413 feet, and prospected during 1888 at that depth.

In 1890 the Sulieman Consols Company at Devil's Point shaft worked a large lode, which proved irregular in size and shape, and yielded from 4 dwt. to 6 dwt. of gold to the ton. Portion of the ground held by the North Sulieman Company was let on tribute to a new party that opened out, at the 300-ft. level, to work a block of ground under the New Perseverance Company, to which the ground was secured to a depth of 220 feet only. A considerable amount of prospecting was done by the North Sulieman Company, but not finding anything payable, it ceased work at the end of 1890. The veins opened by the New Perseverance Company, though very small, were of fair quality.

Early in 1891 work was resumed at the North Queen shaft by a party of tributers, who opened up a large body of stone 400 feet west of the shaft at the 337-ft. level. Fair prospects were obtained on the Indicator line. The Sulieman Consols Company worked until the end of 1892, when it gave up the tribute, its last year's operations being unprofitable. Various prospecting parties worked the shallow ground until 1897, the deepest workings being at the North Queen shaft at 337 feet from the surface.

From 1887 the chief work on the lease was carried out by the tribute parties, and this at comparatively shallow levels; and notwithstanding the large amount of gold won from the area in the past, the company made no attempt to develop the claim at a depth.

The large battery installed in 1861 continued to crush for the tribute parties, as well as for the general public until the end of 1897, when the chief crushing was carried out by the Victoria United Company, which purchased the battery in 1899. The leases at this date were disposed of to the New Zealand Trust Company, which began to sink a new shaft on the crest of the hill.

The yields recorded from the Black Hill Company were as under. These include yields from some of the tribute blocks, but the others are

given under headings of the Queen, the Queen No. 2, the Queen's Jubilee, the North Sulieman, the Sulieman Consols, etc.

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons | oz. | dwt. | gr. |
| 1854 to 1864 .. | 147,807 | 16,346 | 15 | 0 |
| 1865 .. .. | 22,226 | 3,039 | 19 | 0 |
| 1866 .. .. | 19,971 | 4,025 | 10 | 0 |
| 1867 .. .. | 20,431 | 4,361 | 16 | 12 |
| 1868 .. .. | 20,138 | 5,228 | 15 | 0 |
| 1869 .. .. | 16,160 | 3,178 | 7 | 4 |
| 1870 .. .. | 13,687 | 1,384 | 12 | 9 |
| 1871 .. .. | 12,983 | 1,901 | 9 | 11 |
| 1872 .. .. | 6,863 | 3,431 | 16 | 3 |
| 1873 .. .. | 5,578½ | 2,066 | 2 | 19 |
| 1874 .. .. | 5,886 | 3,436 | 11 | 2 |
| 1875 .. .. | 5,845 | 3,768 | 16 | 21 |
| 1876 .. .. | 6,344 | 2,025 | 0 | 21 |
| 1877 .. .. | 7,017 | 1,674 | 13 | 23 |
| 1878 .. .. | 7,147 | 2,335 | 0 | 5 |
| 1879 .. .. | 12,298 | 4,262 | 8 | 9 |
| 1880 .. .. | 12,110 | 6,510 | 17 | 4 |
| 1881 .. .. | 11,978 | 4,296 | 11 | 1 |
| 1882 .. .. | 12,525 | 4,994 | 3 | 23 |
| 1883 .. .. | 11,182 | 3,661 | 1 | 17 |
| 1884 .. .. | 4,753 | 1,761 | 0 | 14 |
| 1885 .. .. | 3,152 | 1,345 | 18 | 15 |
| 1886 .. .. | 3,153 | 1,047 | 17 | 18 |
| 1887 .. .. | 850 | 459 | 13 | 3 |
| 1888 .. .. | 314 | 91 | 1 | 0 |
| 1889 .. .. | 1,034 | 319 | 12 | 4 |
| 1890 .. .. | 2,420 | 612 | 1 | 8 |
| 1891 .. .. | 1,372 | 527 | 5 | 9 |
| 1892 .. .. | 3,986 | 1,066 | 3 | 6 |
| 1893 .. .. | 1,732 | 500 | 13 | 2 |
| 1894 .. .. | 1,819 | 599 | 5 | 0 |
| 1895 .. .. | 1,475 | 478 | 4 | 0 |
| 1896 .. .. | 1,072 | 366 | 16 | 0 |
| 1897 .. .. | 1,571 | 559 | 7 | 0 |

### BRITISH QUEEN COMPANY.

The British Queen Company, formed in 1891, secured the ground that had been worked by Lester and party and others for many years. A main shaft was started in November, 1891. By April, 1892, a depth of 400 feet was attained, and cross-cuts east and west were begun at that depth. At 30 feet west of the shaft the Indicator was found, and a drive was started north and south along it.

The east cross-cut at the 400-ft. level passed through quartz at 40 feet, along which drives were opened. In the north drive the reef was payable, and in the south drive it carried gold. A rise was put up 46 feet above the cross-cut at 81 feet east of the shaft.

The 400-ft. level was opened in 1892, and the veins on the Indicator and Streaky Slates yielded patches of nuggets in 1892 and 1893. The east cross-cut was put out for the Eastern Indicator, after the veins on the Indicator and Streaky Slates became poor, in 1893. By April, 1893, when the shaft was 510 feet deep, cross-cutting at the 500-ft. level was in progress, and at 66 feet from the shaft a formation of poor value was cut. The west cross-cut passed through the Indicator slates at 25 feet from the shaft, and a rise was put up at this point; 20 feet above the level a large vein was cut, and drives were put in along it, but the quartz was of low grade.

In 1894, the cross-cut at the 500-ft. level was driven 260 feet west to a slide; a rise put up on this slide passed through formations with occasional prospects of gold. The 400-ft. level was extended to the slide, and the rise from the 500-ft. level was connected with this level. The drive south on the Indicator slates yielded several small patches of nuggets from a small vein within 150 feet of the cross-cut.

For the half-year ending October, 1894, 704 tons of quartz yielded 265 oz. of gold.

By October, 1895, the shaft was sunk to 600 feet, and cross-cuts were opened out east and west. From the west cross-cut drives were put in south on the Indicator, and on the 4-ft. Slate, at 250 feet from the shaft; the lode in the latter drive was disturbed. The 500-ft. level west cross-cut was extended to 630 feet, and a rise was put up on a pug seam. At the 300-ft. and 400-ft. levels prospecting and stoping were carried out on the Western Slates in large bodies of ore, which yielded fair returns. At the 300-ft. level a flat formation 40 ft. wide and 4 ft. thick carrying coarse gold was opened up at 250 feet west of the shaft.

In 1896, the shaft was sunk to 700 feet, but no level was opened out at that depth until the end of the year. The drive on the Indicator at the 600-ft. level was continued to 480 feet south of the cross-cut; it passed through several poor flat ore bodies. At the 500-ft. level the southern workings proved only poor stone.

Most of the quartz crushed during the year came from the stopes at the 300-ft. level, where a large body of ore showed both north and south of the cross-cut on the Western Slates belt of country. The 400-ft. level south main drive on the Western Slates was driven 550 feet and passed through two flat veins of quartz. The north drive was extended to 250 feet, where a rise was put up to cut the lode proved underfoot in the 300-ft. level. For the year ending October, 1896, 5,053 tons of ore yielded 1,387 oz. of gold.

During 1897, the 700-ft. level was opened. In the western crosscut the Indicator was found near the shaft, and a drive was put in 50 feet north along it; the western cross-cut was then continued to 250 ft., where there was a large formation on which a rise was put up, but trial crushings proved it unpayable. The east cross-cut from the shaft passed through a large ore body at 20 feet, and a short drive was put in south. At 80 feet from the shaft was a large slide dipping west. At the 500-ft. level poor stone only was found. Payable quartz was stoped for a time above the 400-ft. level. The stopes at the 300-ft. level continued to yield payable ore from both north and south of the cross-cut; the north drive and stopes were worked to a cross-course.

Early in 1898 operations at the mine were suspended, and the mine lay idle until the middle of 1899. Shortly afterwards, a large body of payable quartz was located on the Indicator and Streaky Slates at a depth of 800 feet. Meanwhile, the 900-ft. level was driven westerly, and the stone, which pitched underfoot from the 800-ft. level, was located by an intermediate level, but was poor. Throughout the years 1900, 1901, and 1902 the mine had a prosperous career, and treated 20,364 tons for 5,382 oz.

Shortly afterwards, the British Queen Company was wound up, and the mine became the property of the Woah Hawp No. 1 Company during 1903 (see p. 247).

The following yields were obtained by this company:—

| Year. | Ore Crushed. | Gold Yield. |
|---|---|---|
| | Tons. | oz. dwt. gr. |
| 1892 (2 quarters) | 271 | 60 11 12 |
| 1893 .. .. | 696 | 226 19 18 |
| 1894 (2 quarters) | 1,259 | 483 11 18 |
| 1895 .. .. | 3,517 | 2,425 14 12 |
| 1896 .. .. | 4,807 | 1,271 9 12 |
| 1897 .. .. | 2,543 | 614 7 18 |
| 1898 (2 quarters) | 375 | 68 12 18 |
| 1899 (2 quarters) | 345 | 112 3 0 |
| 1900 .. .. | 6,773 | 1,623 1 0 |
| 1901 .. .. | 7,409 | 2,044 1 0 |
| 1902 .. .. | 5,613 | 1,352 4 0 |
| 1903 (1 quarter) | 569 | 153 2 0 |

CANADIAN COMPANY.

The Canadian Company (42 shareholders) erected a battery of sixteen heads on the northern side of the Canadian Gully in June, 1860. Crushing material was first obtained from the crown of the hill to the north, but the quartz was unpayable. A crushing of 1,000 tons of refuse from the alluvial claims yielded only 1 dwt. to the ton, which merely paid expenses. A crushing of 250 tons of quartz taken from an incline tunnel on the face of the hill yielded 100 oz. of gold, the next crushing of 400 tons yielded only 80 oz., and a third parcel of 300 tons only 30 oz. By the end of 1860 the payable ore located in the tunnel was found to continue under the hill, and a main shaft was started near the crown; in the shaft a gold-bearing spur was struck at water-level; another 12 ft. wide at 190 feet; and a third 8 ft. wide at 50 feet (December, 1861), from which good yields were obtained. By working the battery both night and day, a yield of under 2 dwt. sufficed to pay expenses, while 3 dwt. and 4 dwt. stone gave handsome dividends. The quantity of stone treated each month during 1861 was 1,000 tons, and the yields varied from 38 oz. to 157 oz. a fortnight.

The following yields were recorded*:—

| Period. | Ore Crushed. | Gold per Ton. | Remarks. |
|---|---|---|---|
| | tons. | dwt. gr. | |
| July, 1861 .. | 1,100 | 2 12 | Surface to 80 ft. |
| August, 1861 .. | 800 | 2 0 | „ „ |
| September, 1861 .. | 700 | 2 0 | „ „ |
| October, 1861 .. | 300 | 2 10 | Surface to 30 ft. |
| November, 1861 .. | 300 | 2 10 | „ „ |
| January, 1862 .. | .. | 1 12 | |

CARLSBACH AND PARTY, OLD POST OFFICE HILL.

Among the earliest to work the quartz lodes in the Ballarat District were Messrs. Carlsbach, Wellsford, and Garten, who took up a claim on the Old Post Office Hill in 1854. In 1856, the party had a main shaft 75 feet deep, the means of access to which was a ladderway as far as a landing, and below this a winding excavated stairway. At the 75-ft. level the drive was 108 feet in length and from 15 feet to 20 feet in height. Five shafts were connected with the main drive for stoping and ventilation. Pillars were left to support the roof and sides, and no timber was used underground. No water was met with. The party extracted over 3,000 tons of quartz by 1856. Up to this time they had merely washed out the free gold without attempting to crush the quartz (see p. 106), but even this method yielded a good return, and led to the opening up of the Old Post Office reef, where 70 claims were marked out in 1856.

CORNISH UNITED COMPANY.

The Cornish United Company held a claim on the Gum Tree Flat, behind the Blue Jacket hotel and north of and adjoining the property of the Llanberris Company, near where the Old Gravel Pits lead joined the main lead coming in from the south. The company was formed in February, 1859, to work the abandoned alluvial, but while so engaged it located a quartz reef, a trial crushing of 20 tons from which yielded 16 dwt. to the ton, and this after the finer material had been treated in a puddling machine. A main shaft was sunk to a depth of 150 feet, and a winding, pumping, and crushing plant (twelve heads) was erected towards the end of 1859. In May, 1860, weekly crushings of 150 tons of quartz averaged 8 dwt. of gold to the ton. A second shaft was sunk, and the lode was cut at a depth of 60 feet; it was 20 ft. wide with some rich veins on the walls, from which specimens of gold up to an ounce were obtained. Throughout 1860 and 1861 the yields averaged 5 dwt. to 7 dwt. per ton. In November, 1861, the lode was cut at a depth of 240 feet in the main shaft, and proved to be 40 ft. wide. The old records show that, in 1860, 111 oz. was won (no tonnage given); and that, in 1861, a parcel of 1,200 tons from the 200-ft. level averaged 4 dwt. to the ton, and another of 200 tons from the 175-ft. level averaged 7 dwt. to the ton.

COUNTESS COMPANY.

The Countess Company, which worked a lode of that name on the southern side of Victoria-street in 1877, sank three shafts. At the No. 1 shaft the shoot of gold went underfoot from the 300-ft. level, and the shaft was sunk to 360 feet, but the tributers failed to locate anything of value, and the shaft was abandoned in 1879. 477 tons of stone from the No. 2 shaft yielded 112 oz. 4 dwt. 18 gr. of gold in 1877. During 1878 stone averaging 5 dwt. of gold to the ton was won from No. 1 shaft. The lode had a westerly underlie of 1 in 2, and was 185 feet west of No. 1 shaft at the 360-ft. level. During 1879 the yields fell away, and tribute parties fossicked at Nos. 2 and 3 shafts within 60 feet of the surface.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | |
| 1871 .. .. | 1,200 | 180 0 0 | Last quarter |
| 1872 .. .. | 1,640 | 276 0 0 | Six months |
| 1873 .. .. | .. | .. | .. |
| 1874 .. .. | 484 | 168 3 0 | Third quarter |
| 1875 .. .. | 2,153 | 724 10 18 | |
| 1876 .. .. | 2,709 | 997 14 3 | |
| 1877 .. .. | 2,131 | 761 10 2 | |
| 1878 .. .. | 1,315 | 281 15 0 | Nine months |
| 1879 .. .. | 188 | 44 0 6 | First half |

CRITERION COMPANY.

The Criterion Company (14 shareholders) was formed in 1861 to mine quartz at Mopoke Gully, Black Hill. A battery of eight heads, driven by a 15 horse-power engine, was erected between Mopoke and Two Ton gullies. While excavating for the battery, the company found alluvial at

* Yields from official records, especially for early years, differ considerably from those recorded elsewhere.

a depth of 40 feet, consisting mostly of quartz *débris;* this, as well as numerous heaps of tailings, was treated. The alluvial and surface stuff averaged about 2½ dwt. to 3½ dwt of gold to the ton. In 1861, after the surface stuff had been treated, attention was paid to the quartz reefs in the claim, and some payable stone was mined. Some well-developed crystals of gold were found in a reef below the battery at a depth of 15 feet. In 1861, 600 tons averaged 3 dwt. 15 gr.; 560 tons from the open cut averaged 3 dwt. 12 gr.; and 200 tons from the 40-ft. level averaged 4 dwt. to the ton.

CROCODILE COMPANY.

The Crocodile Company (11 shareholders) erected an eight-head battery at the head of Mopoke Gully, and started to crush quartz from an open cut in June, 1860. The first crushing of 80 tons yielded 42 oz. of gold. More stone was available than the battery could treat, and four heads were added in October, 1860. The weekly dividends were £8 to £16 per share, and shares were worth £500. In November, 1860, crushings of 180 tons to 200 tons of quartz per week returned about 3½ dwt to the ton, and yielded handsome dividends owing to the economic methods adopted in working. During 1861, the weekly yield averaged about 30 oz., and regular dividends were paid.

The following yields have been recorded:—In 1860, 124 tons yielded 24 oz.; in 1861, a parcel of 180 tons returned 45 oz.; another, of 500 tons, averaged 4 dwt.; 348 tons from the open cut, 35 feet deep, averaged 5 dwt. 12 gr.; and 450 tons from the open cut, at 40 feet deep, averaged 4 dwt. to the ton.

DALZELL-BUCHANAN COMPANY.

The ground held by the Dalzell-Buchanan Company was first taken up, about 1872, by Messrs. Dalzell and Buchanan, who prospected at various points, and, in 1886, began to sink a main shaft. As the mine was private property, no record of the work was published.

In 1899, the Dalzell-Buchanan Company was formed. The shaft, which was then 470 feet deep, was continued, and meanwhile a number of surface blocks were let on tribute. By the end of 1899 a plat was cut at a depth of 670 feet, and cross-cuts east and west were commenced. The shaft passed through several gold-bearing quartz veins.

The east cross-cut at 94 feet from the shaft intersected the continuation of the lode worked by Dalzell and Buchanan in the shallow levels, but the reef was small and poor. The west cross-cut at 101 feet from the shaft intersected quartz 12 ft. wide of promising appearance, but a trial crushing from ore in the drives north and south was unpayable. At 129 feet a small formation was found on the 12-ft. Slate; it increased in size in a south drive, and at 100 feet from the cross-cut the quartz was 20 ft. wide. In the north drive on the 12-ft. Slate the quartz increased in size, but remained poor.

During 1900 the main shaft was sunk to 770 feet; an opening was made at 570 feet, and a cross-cut was driven east to the Streaky Slates at 52 feet from the shaft. A rise on this formation intersected two veins showing a little gold.

The western cross-cut at the 670-ft. level was extended 198 feet from the shaft. At the end of the cross-cut there was a lode on the 12-ft. Slate; it was small but showed fair gold, and widened out in the drives north and south. The north drive was put in 16 feet from the cross-cut, and proved that the lode was 5 ft. wide, on which a rise was put up from the end of the drive, proving a large amount of quartz above the level. The south drive was extended 100 feet, where the lode in the face was 20 ft. wide.

At a depth of 770 feet a west cross-cut was put in to connect with a winze sunk below the 670-ft. level on a large body of gold-bearing quartz. At 128 feet from the shaft the lode was intersected; it proved to be poor, and drives of 120 feet and 40 feet north and south respectively failed to meet with richer quartz. A rise was connected with the winze, and an intermediate level was opened north on a body of ore averaging from 10 ft. to 20 ft. wide, which was stoped but proved to be poor, although the same lode taken out of the winze to a depth of 40 feet had averaged 6½ dwt. of gold to the ton.

In 1901, all work ceased below the 470-ft. level, where driving north on the Indicator was begun at 350 feet north of the shaft; quartz was found, but, although small patches of rough gold were seen on the Indicator, the bulk of the lode was unpayable. The drive was continued north through a cross-course, and the lode worked by the Golden Gate Company was picked up. Several rises on the Indicator located small bodies of payable quartz. A drive south was connected with the Little's Defiance mine, but only poor quartz was located. Both drives and rises at this level intersected very broken country, and although plenty of quartz was located nothing payable was found.

In 1902, a cross-cut east at a depth of 240 feet disclosed a body of mineralized quartz, and a short shoot of stone of fair value was stoped above this drive.

Failing to locate anything of value in the shallow levels, the company began to unwater the shaft in August, 1903, and then extended the cross-cuts westerly at the 570-ft. and 670-ft. levels, the former to 490 feet and the latter to 260 feet, before work ceased in 1905. While these operations were in progress, the shaft was being unwatered to the bottom and sunk a further 60 feet.

The yields recorded from the mine total 18,986 oz., but, according to the figures supplied by the late Mr. Dalzell, the total should be 20,000 oz. of smelted gold, and 1,200 oz. from pyrites, making 21,200 oz. in all. Working expenses during the same period amounted to £38,950, and dividends to £43,850:—

| Year. | Ore Crushed. | Gold Won. | | |
|---|---|---|---|---|
| | Tons. | oz. | dwt. | gr. |
| 1889 .. .. | 5,700 | 3,339 | 14 | 13 |
| 1890 .. .. | 6,600 | 2,430 | 0 | 0 |
| 1891 .. .. | 5,800 | 1,573 | 5 | 16 |
| 1892 .. .. | 5,300 | 985 | 0 | 0 |
| 1893 .. .. | 8,300 | 1,650 | 0 | 0 |
| 1894 .. .. | 8,200 | 1,642 | 0 | 0 |
| 1895 .. .. | 7,300 | 1,490 | 0 | 0 |
| 1896 .. .. | 9,300 | 1,742 | 8 | 0 |
| 1897 .. .. | 2,881 | 356 | 0 | 0 |
| 1898 .. .. | 4,703 | 396 | 5 | 12 |
| 1899 .. .. | 1,650 | 321 | 7 | 12 |
| 1900 .. .. | 1,861 | 362 | 8 | 0 |
| 1901 .. .. | 1,541 | 300 | 14 | 0 |
| 1902 .. .. | 1,086 | 203 | 18 | 0 |
| 1903 .. .. | 376 | 17 | 10 | 0 |
| 1904 .. .. | 978 | 121 | 6 | 0 |

DALZELL-CUM-PRINCE REGENT COMPANY.

The Dalzell-cum-Prince Regent Company was formed in September, 1889, to work a portion of Clark's Claim at Sailors Gully below the 300-ft. level. The old shaft was sunk from 300 feet to 397 feet and a cross-cut was opened out east at 390 feet to intersect the large body of quartz that had been worked by the Prince Regent Company to its boundary for a return of 10 dwt. of gold to the ton.

In 1890 the shaft was continued to a depth of 550 feet and Nos. 2 and 3 levels were opened out at 496 feet and 546 feet respectively. Payable ore was located at both levels.

In 1891 the shaft was deepened; it passed through several gold-bearing veins at 625 feet, 640 feet and 652 feet. Cross-cutting, driving and stoping were carried on at No. 3 (546 ft.) and No. 4 (580 ft.) levels, and work was resumed at No. 2 level.

In 1892 the 640 ft. (No. 5) level was opened in a large body of poor quartz. Stoping at No. 4 level was continued until the quartz was exhausted. Payable quartz was located at No. 3 level near the old stopes.

In 1893 No. 6 level was opened at a depth of 699 feet, and payable quartz was located in the east cross-cut. The shaft passed through a large body of quartz at 665 feet from the surface. At No. 2 level nothing of value was found.

In 1894 the most of the mine was let on tribute. The shaft was sunk to a depth of 750 feet, but no level was opened at this depth. No. 2 west cross-cut was continued to 502 feet from the shaft to intersect the Sulieman line of country, and the tributers opened up a large quantity of payable ore at this level.

In 1895 the 764 ft. (No. 7) level was opened, and cross-cuts were put in with poor results. At No. 6 level much poor quartz was located, and a small vein south of the cross-cut yielded from 5 dwt. to 10 dwt. of gold to the ton. The tributers abandoned No. 2 level.

In 1896 the 889 ft. (No. 8) level was opened and a leather-jacket (slide) was cut in the well at 10 feet below this level.

In 1897 the shaft was sunk to 973 feet, where No. 9 level was opened and cross-cuts east and west were put in; a drive south connected with the Prince Regent Company's workings and stopes over this drive gave poor results.

In 1898 large bodies of quartz of varying qualities were prospected on the 4-ft. Slate at and above the No. 9 level.

In 1899 nothing payable was located at No. 9 level. Tribute parties worked at Nos. 8, 7 and 5 levels with poor results, and work ceased in 1900.

Details of Levels.

*496-ft. (No. 2) Level.*—No. 2 level was opened out at a depth of 496 feet in 1890; the cross-cut was extended to the reef at 86 feet east from the shaft, and driving and stoping were carried out with profitable results; the quartz on this line was exhausted in 1891.

In 1892 the west cross-cut was extended to 198 feet from the shaft, and at 135 feet it passed through quartz carrying a little gold, which proved to be 4 ft. wide. At 151 feet mixed quartz and slate showing gold was found. This formation yielded 4½ dwt. of gold to the ton.

In 1893 the cross-cut west was in 283 feet, the last 6 feet being in a mixture of slate and quartz, which, however, carried no gold. Over 200 feet of cross-cutting was carried out north-easterly and north-westerly from the north drive. In the north-west cross-cut a fair body of quartz was found north of the crosscourse; it was opened up but proved unpayable.

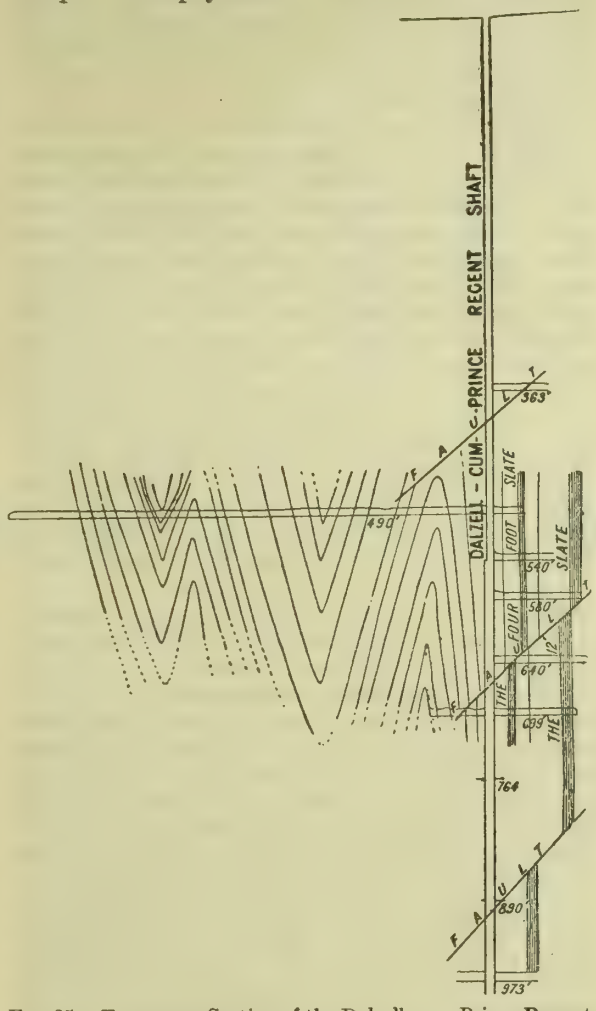



FIG. 25. Transverse Section of the Dalzell-cum-Prince Regent Shaft. Scale 200 to 1 inch.

During 1894 the cross-cut west was extended to 502½ feet from the shaft. Two parties of tributers worked a formation in the west cross-cut at this level, which was abandoned in 1895.

During 1896 a drive was opened out north to cut a formation then being worked by the company adjoining to the north to within 10 feet of the northern boundary.

Driving south of the cross-course and stoping were in progress during 1897. At 60 feet in the main west cross-cut an anticlinal fold, and at 343 feet a synclinal fold were found. A cross-cut 38 feet east entered the 4-ft. Slate.

*546-ft. (No. 3) Level.*—During 1890 an opening was made on the east side of the shaft at 546 feet. A cross-cut was put out 370 feet; at 93 feet it intersected quartz showing gold freely, and at 140 feet quartz 2 ft. 6 in. thick showing a little gold and carrying a good deal of sulphides. Drives on these makes and also on the intervening country proved payable ore. Stoping was the chief work carried out during 1891 and 1892. In 1893 a rise was put up from this level through old stopes to cut the continuation of some flat quartz veins that were being worked by the adjoining company. These veins were small but payable.

*580-ft. (No. 4) Level.*—During 1891 a plat was opened at 580 feet, and a cross-cut was driven east 90 feet to the 12-ft. Slate. At 30 feet it

intersected the 4-ft. Slate, and at 20 feet three leaders carrying quartz 2 ft. wide and showing gold. At 85 feet there was a large body of quartz carrying pyrites and a little gold. Stoping and driving were carried out during the year (1891).

In 1892 further stoping and driving were undertaken, but the returns were not as good as those of the previous year. In 1893 stoping was continued at this level.

*640-ft. (No. 5) Level.*—This level was opened in 1892 at a depth of 640 feet, and a cross-cut was driven east for 96 feet. From the shaft to 36 feet it passed through a big body of quartz, which was opened out on and averaged 7 ft. wide between the hanging wall and footwall, with auriferous flat veins coming in from both sides. The 12-ft. Slate was intersected at 65 feet. In 1893 driving and stoping were carried out in a large body of quartz with poor results.

The tributers at this level worked a fair-sized body of quartz during 1894, 54 tons yielding 28 ozs. 3 dwts. During 1899 Lee and party (tributers) did much work at this level, with varying results. Another party (Elliot and party) did a good deal of driving and stoping south on an eastern ore body that had previously yielded well, but in 1899 it was only about payable.

*699-ft. (No. 6) Level.*—This level was opened in 1893 at a depth of 699 feet. At 25 feet below No. 5 level the shaft passed through a large body of west-dipping quartz which showed gold. The cross-cut was put out 160 feet east to the boundary; and at 83 feet from the shaft it passed through payable quartz 1 ft. 6 in. wide, well mineralized, dipping east, and which was considered to be connected with the quartz intersected in the shaft. Drives on this vein north 26 feet to the cross-course and south 47 feet proved quartz throughout. A cross-cut west was put in 55 feet; but was then discontinued, as no bodies of quartz were found. At 28 feet it passed through the track of the western make of quartz, which was worked by the tributers at No. 5 level where it was only a few inches thick.

In 1894 the south drive was extended 97 feet on the formation that had been intersected by the main east cross-cut. A north-westerly drive was extended along a cross-course for 106 feet from the main east cross-cut, but no quartz was found.

During 1895 the north-west drive along the cross-course was continued to 197 feet from the cross-cut; and at 75 feet a drive from it was put in north 27 feet on the Big Slate, and a bore was put up 30 feet without finding any quartz. The north-west drive was then continued, and between the Big Slate and the 4-ft. Slate it cut the top of some quartz, which gave a good dish prospect, and went underfoot to the east. At 192 feet from the cross-cut the north-west drive intersected the main body of quartz; a drive was put in north along this formation, and two trial crushings taken from it yielded 1 dwt. and 2 dwt. of gold to the ton respectively. Several rises from this level intersected large bodies of quartz, none of which were payable. The stopes in the south drive carried 1 ft. 6 in. of quartz, which yielded from 5 dwt. to 10 dwt. of gold to the ton. This level was again let on tribute in 1896, and the results obtained were variable.

*764-ft. (No. 7) Level.*—During 1895 a chamber was opened out at 764 feet deep, and 141 feet of prospecting drives and cross-cuts were put in with poor results. In 1899 Wells and party (tributers), did some unsuccessful work at this level.

*890-ft. (No. 8) level.*—In 1896 No. 8 level was opened at 890 feet from the surface. A cross-cut east intersected quartz north of the cross-course at 32 feet from the shaft; a drive was opened south on this formation, but at 40 feet the quartz was poor and the drive was stopped. At 40 feet north of the shaft (on the north side of the cross-course) a rise was put up to get above the slide, and a body of quartz was intersected, which gave out a large quantity of water, and also carried good gold; the stone was worked with profitable results for 50 feet along its course, one crushing of 134 tons yielding 82 oz. 18 dwt. of smelted gold. A rise was also put up from the eastern cross-cut to intersect the payable quartz worked by the company adjoining on the south.

During 1899 the tributers (White and party) worked the reef at the north end of the main drive with payable results. Nothing was done in the south drive during the latter part of the year, but a good deal of work was carried out there in the earlier part.

*973-ft. (No. 9) Level.*—During 1897 a plat was opened at a depth of 973 feet on the south side of the shaft, and cross-cuts were driven east and west. At 39 feet the eastern cross-cut intersected the Big Slate and the 4-ft. Slate, where a drive south on a small quartz vein giving fair prospects was put in for 17 feet. At this point No. 1 rise was put up to intersect the run of quartz being worked by the company adjoining on the south. At a height of 60 feet an opening was made on the west side of the rise, and a drive was put out south to meet the north drive that was being extended from the Prince Regent mine at the south boundary. When these drives met, stoping was carried on in faces of payable stone that had the appearance of continuing for some distance. No. 2 rise was put up 11 feet from the main level on the 4-ft. Slate, which carried a large body of quartz of promising appearance.

In 1898 No. 2 rise on the 4-ft. Slate was continued to 75 feet, passing through a large body of quartz. At a height of 50 feet a drive opened 115 feet south passed through numerous small makes of quartz, some of which gave fair dish prospects. From the top of No. 1 rise driving and stoping on the Big Slate were carried on. This formation was payable to near the large course, where it became poor.

During 1899 cross-cutting was carried on at the north end of the level, but no payable formation was located. Dicken and party (tributers) put a cross-cut out west of the 4-ft. Slate in the south end from the top of the No. 2 rise, but they found nothing payable.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons | oz. | dwt. | gr. |
| 1892 (2 quarters) | 3,230 | 1,278 | 10 | 6 |
| 1894 (1 quarter).. | 529 | 185 | 4 | 6 |
| 1896 .. .. | 2,344 | 705 | 0 | 16 |
| 1897 .. .. | 1,523 | 457 | 16 | 0 |
| 1898 .. .. | 1,173 | 330 | 3 | 8 |
| 1899 .. .. | .. | 248 | 10 | 0 |
| 1900 .. .. | .. | 12 | 13 | 0 |

The total quantity of ore crushed, 8,799 tons, yielded 3,217 oz. 17 dwt. of gold.

DANISH COMPANY.

This company was formed in 1860 to work the quartz reefs on Bakery Hill adjacent to St. Paul's Church reserve. The site where the Welcome

nugget had been found was within the claim. The company erected a 12-head battery driven by a 15 h.p. engine, and began crushing in October, 1860. The lode, which was struck at a depth of 250 ft., the greatest depth attained in the locality at that time, proved to be 8 ft. wide, and carried gold. By May, 1861, payable returns were won, and regular dividends were paid. During the five months ending November, 1861, the value of gold won amounted to £3,981. The weekly expenses were £50, and the average weekly profit was £9 5s. By the end of 1861 the ore became poorer. Prospecting was continued till 1864, when the mine was abandoned after three months' work at shallow levels. The workings of this company caused a settlement of portion of the foundations of St. Paul's Church, prior to suspension of operations. The only recorded yield is 1,440 tons for 100 oz., taken from a depth of 160 feet, in 1864.

### DONNYBROOK COMPANY.

During the excitement of the rush for quartz claims in 1860, when every available reef was marked out, the Donnybrook Company (16 shareholders) sank a shaft at Poverty Point, and intersected a reef 15 ft. wide at a depth of 80 ft. A 12-head battery driven by a 25 h.p. engine was erected at a cost of £3,000, and crushing began late in December, 1860, but was suspended in February, 1861, as the ore crushed carried under 3 dwt. of gold to the ton, and was unpayable. The shaft was deepened and a cross-cut was put in at the 175-ft. level, where a reef 15 ft. wide was found, but proved to be poor. In August, 1861, the company was wound up.

### DUCHESS COMPANY.

The Duchess Company began work early in 1873 on Black Hill Flat, in the vicinity of the railway line, but the yields were small, and the mine was let on terms to a party of tributers in the following October. From October, 1873, to January, 1874, 1,051 tons of stone yielded 510 oz. 11 dwt. of gold. The quartz was won from a depth of 140 feet. In 1874 the shaft was sunk to 200 feet, and to this depth large bodies of profitable stone were mined. Towards the end of 1875 a further sink of 50 ft. was undertaken, and some of the richest stone yet found in the mine was disclosed, and this led to further sinking, making the total depth 360 feet. Small dividends were paid in 1875, 1876, 1877, and 1878. Towards the close of 1877 the bottom or 360-ft. level was flooded, and prospecting was confined to the 200-ft., 250-ft., and 300-ft. levels. A second shaft was repaired in 1878, and prospecting was carried on for a time, the Western lode being cut at 207 feet from the shaft, but no gold was visible. Regular crushings were kept up from the 300-ft. and shallower levels at No. 1 shaft during 1879, 1880, and 1881. In 1881 the mine closed down; prior to this a block of reef-wash, which averaged 7 oz. 12 dwt. of gold to the machine, had been explored from the No. 2 shaft.

The yields from the Duchess mine were:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons | oz. | dwt. | gr. |
| 1873 .. .. | 955 | 457 | 16 | 21 |
| 1874 .. .. | 4,142 | 1,454 | 4 | 16 |
| 1875 .. .. | 1,937 | 586 | 9 | 17 |
| 1876 .. .. | 2,658 | 1,295 | 9 | 10 |
| 1877 .. .. | 1,975 | 788 | 13 | 8 |
| 1878 .. .. | 3,066 | 1,570 | 4 | 12 |
| 1879 .. .. | 2,948 | 1,197 | 6 | 12 |
| 1880 .. .. | 524 | 265 | 7 | 3 |
| 1881 .. .. | 383 | 130 | 3 | 10 |

### EMERALD COMPANY.

The Emerald Company, formed in September, 1862, secured the block of ground (Greene's) formerly held by the Allied Armies Company, together with some additional private property. The No. 2 shaft of the Allied Armies Company was utilized for a main shaft; this shaft (6 ft. x 3 ft.), which was 210 feet in depth, passed through 80 feet of basalt and bottomed at a depth of 90 feet. The Emerald Company, finding the drives of the former company to be useless, opened out a new drive northwards, and reached the Inkerman gutter at a distance of 530 feet. At 90 feet from the shaft was a quartz lode 4 ft. to 10 ft. wide, underlying east, in some places very flatly. This lode was followed north and south for a distance of 130 feet; a trial crushing yielded 17 dwt. of gold to the ton. A second crushing of 120 tons, in June, 1863, yielded 34 oz., an average of 5 dwt. 15 gr. to the ton. A battery was erected, but no crushing was done owing to financial difficulties. The original objective of the company was to exploit the Awful lead, which had been proved in the workings of the Allied Army Company from this shaft, and which derived its name from the quantity of water that had to be overcome to work it.

Later, the ground was secured by the Great Northern Company (see p. 86).

### ENTERPRISE COMPANY.

The Enterprise Company, which adjoined the Llanberris Company on the south, erected a battery early in 1860. The mine was situated on the Red Streak lead, famous in the alluvial days for its rich yields. The quartz averaged about 13 dwt. of gold to the ton, and dividends, ranging from £12 to £30 per week, were paid to the sixteen shareholders. The reef was from 5 ft. to 6 ft. wide, but the veins in the slate casing carried the heaviest gold. In October, 1860, a second shaft was sunk further south. During the preceding six months the company obtained 2,300 oz. of gold from crushing in an eight-head battery. By the end of 1860, the company occupied the premier position among the quartz mines of the Ballarat field. The average weekly crushing was 80 tons for a total yield of 3,000 oz. between the 25th of March and the end of the year. The highest weekly dividend was £30 per share for three successive weeks; the lowest was £6; and the total for the nine months amounted to over £600 per man. The lode was first found at a depth of 45 feet; at this depth it was 7 ft. wide, and at the 125-ft. level it ranged from 6 ft. to 7 ft. wide.

In 1861, the company endeavoured to reorganize, so that a more extensive scheme of operations could be undertaken, but, owing to the general depression in quartz mining caused by the failure of many of the boom companies, the project fell through. A marked depreciation in the returns took place during the first six months of 1861, and by the end of June they merely paid expenses. Crushing ceased in August, 1861, and operations were confined to exploratory work below, until the end of the year. Failing to locate new shoots of payable ore, the claimholders decided to sell the plant and to wind up the company.

The New Enterprise Company, consisting of eight shareholders, bought the plant and mine for £400. By cleaning up the *débris*, &c., in the vicinity of the battery sufficient gold to cover the cost of purchase was obtained, and in February,

1863, the claim was sold to Messrs. Learmonth for £1,000. After erecting a new plant the Learmonth Brothers sold the claim to the Llanberris Company (see p. 136).

The following yields were recorded:—

| Year. | Ore Crushed. | Average Gold Yield per Ton. | Gold Yield. | Depth. |
|---|---|---|---|---|
| | tons. | oz. dwt. gr. | oz. dwt. gr. | feet. |
| 1860 (6 months).. | .. | .. | 2,300 0 0 | .. |
| 1861 .. | 300 | 0 7 0 | .. | 90 to 160 |
| | 100 | 0 6 0 | .. | 90 to 160 |
| | 40 | 0 5 0 | .. | 150 |
| | 160 | 0 4 0 | .. | 100 to 160 |

### FIRE BRIGADE COMPANY.

The Fire Brigade Quartz Mining Company, Bakery Hill, consisting of 24 shareholders, sank a shaft on the east side of East-street, between Victoria-street and Barkly-street, in 1860. Several rich veins were found at a depth of 190 feet, and a winding engine and a battery of eight-heads was erected early in 1861. A trial crushing of 10 tons averaged 14 dwt. of gold to the ton. The reef was supposed to be the continuation of that being worked by the adjoining Last Chance Company in Specimen Gully. The pyrites was treated by burning in a furnace erected by the company in 1861, and a profitable extraction was made. Owing to the extravagant method of working and the small size of the quartz veins, the company was forced to cease operations and to dispose of the plant in September, 1861.

### GAY'S BAND OF HOPE COMPANY.

Gay's Band of Hope Company (Fig. 26) was formed about 1885 to test the continuation of the Consols line of lode south of the Star of the East mine. In November, 1887, shaft sinking below 420 feet was started, but at the end of 1888 the mine was closed down after a depth of 760 feet had been attained, and a cross-cut of 190 feet had been made at the 680-ft. level.

When operations were resumed in May, 1889, it was evident from the pitch of the lode proved in the Band and Albion workings that this lode must be at a considerable depth in Gay's Band of Hope mine, and a policy of continuous shaft sinking was therefore adopted. During 1890, a depth of 1,240 feet was reached, and at the 1,200-ft. level a cross-cut east intersected a lode at 67 feet from the shaft (Fig. 26); drives north and south proved this lode to be a well-defined saddle reef with a decided southerly pitch. It was, however, unpayable. At 1,400 feet from the surface a lode 1 ft. wide and underlying flatly to the west was cut in the plat. At the 1,300-ft. level the south drive followed the west-dipping quartz to the apex of the fold, in which a winze was sunk to a depth of 20 feet on a reef 1 ft. wide; this was early in 1892. Later on, arrangements were made whereby the extension of a cross-cut east at the 2,250-ft. level of the South Star mine could reach this company's ground, but nothing was found in this drive except west-dipping strata.

In 1901, the yield was 43 oz. 10 dwt. from 300 tons.

### GAY'S FREEHOLD (OR STAR) COMPANY.

The Gay's Freehold or Gay's Star Company, which was formed in 1880, sank a shaft to a depth of 245 feet, opening out at the 212-ft. level, and cross-cutting east. The cross-cut passed through east-dipping strata for 330 feet before breaking into the old alluvial workings of Morgan's Freehold mine. A large mass of quartz was found in the shaft at a depth of about 200 feet. The shaft was sunk to 432 feet by July, 1881, and a cross-cut east at that depth passed through east-dipping strata for 150 feet.

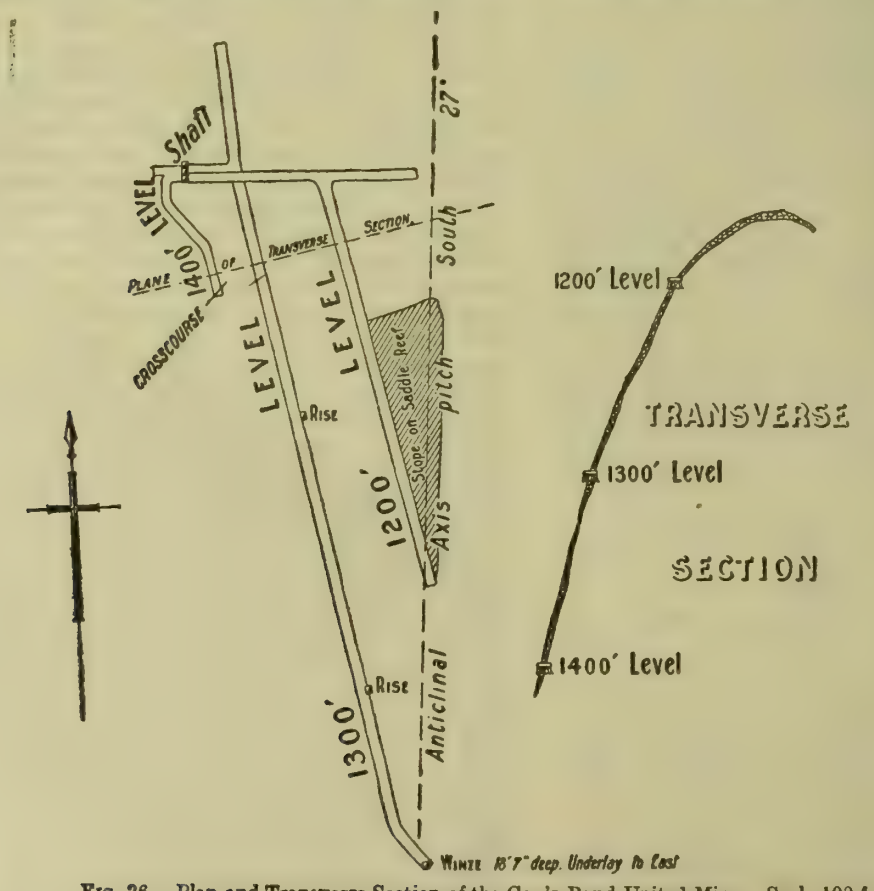



FIG. 26. Plan and Transverse Section of the Gay's Band United Mine. Scale 100 feet to 1 inch.

### HAPPY LAND COMPANY.

The Happy Land Company was formed during the mining boom of 1880 to prospect a lease on the north side of McArthur-street, between the Creswick railway line and Crompton-street; it was near the junction of the A.I. and the Inkerman leads, which were very rich at this point. Numerous quartz reefs were expected, but hopes were not realized. The shaft was sunk to a depth of 212 feet, after bottoming at 106 feet, and cross-cuts were put out 85 feet west and 240 feet east, but they intersected only one leader at 100 feet east. This leader increased to 2 ft. wide and showed a little blackjack and galena.

### HONG KONG COMPANY.

The Hong Kong and the Hopewell companies were two of the parties to erect batteries at Prince Regent Gully during the quartz boom of 1860. The Hong Kong Company was a Chinese company, which began to install its plant in August, 1861.

### HOPEWELL COMPANY.

The Hopewell Company's claim adjoined the Old Canadian on the south. A battery of eight-heads was erected, and crushing began in September, 1860. The battery reduced 100 tons of quartz weekly, while the surface soil near the quartz reefs was puddled with payable results. Some cement in the alluvial of the gully was crushed for a yield of over ½ oz. to the ton during 1861.

The old records show that, in 1860, 30 oz. were won; in 1861, 240 tons from 80 feet deep averaged 2 dwt. 2 gr. to the ton; another parcel of 400 tons from a depth of 80 feet averaged 1 dwt. 2 gr.; and 100 tons from 25 feet deep yielded 3 dwt. to the ton.

### INDEPENDENT COMPANY.

This co-operative company of ten men was formed in 1857 to work a part of the Black Hill. In 1862 it held an area on the crown of the hill measuring 119 feet from the northern to the southern boundary by 300 feet from east to west, a second block on the southern fall of the hill overlooking the creek, and a third, 800 feet by 400 feet, on the western fall; the second and third blocks were held under miners' right titles. The first block was on the Black Hill line of reefs. The quartz was mined in an open cut, from which it was hauled up an inclined tramway, and delivered to the 12-head battery on the western side of the hill by gravitation. The formation consisted of a number of spurs crossing in every direction. Though a small quantity of the stone was rich, the average material crushed was low-grade, but by the economical treatment of large quantities, handsome dividends were paid to the shareholders.

The following yields, &c., were obtained:—

| Period. | Gold Yield. | Value. | Dividends. |
|---|---|---|---|
| | oz. dwt. gr. | £ s. d. | £ s. d. |
| 12th January, 1860, to 23rd July, 1861 .. | 2,130 10 0 | 8,359 16 5 | 1,643 0 0 |
| 23rd July, 1861, to 27th July, 1862 .. | 1,839 15 15 | 7,674 19 5 | 4,188 0 0 |
| 27th July, 1862, to 11th July, 1863 .. | 1,848 16 18 | 7,487 8 0 | 3,620 0 0 |
| July, 1863, to May, 1864 .. | 1,232 13 0 | .. | .. |
| May, 1864, to December, 1865 .. | 1,031 8 15 | .. | .. |
| January, 1865, to December, 1865 .. | 528 14 18 | .. | .. |

The working costs of this party in 1860 were breaking and delivery 3s. 4d., and crushing 4s. per ton.

During 1863, a sum of £6,130 was paid in dividends from quartz that averaged 3 dwt. 12 gr. of gold to the ton. Between the 17th October, 1863, and the 7th May, 1864, the quantity of stone crushed was 7,453 tons, an average of 257 tons per week, and the average yield was 2 dwt. 10½ gr. of gold to the ton. During 1865, 9,320 tons yielded 529 oz., an average of 1 dwt. 3 gr. to the ton.

### INDICATOR COMPANY.

The Indicator Company was formed in 1894. Machinery was installed to unwater the shaft formerly known as the Mazeppa, in which the water was standing at about 300 feet from the surface. In less than a month the water was lowered to 430 feet, and the sinking of a well was completed.

Operations were confined to driving on the Indicator and the adjacent slates, and, during November, 1894, two nuggets, weighing 21 oz. and 23 oz. respectively, were taken from the veins on the Indicator above the 427-ft. level. In December, 1894, 30 oz. of gold was nuggetted out from another vein over the same level, and a 50-ton crushing averaged 13 dwt. to the ton.

In 1895, further prospecting was carried out, a cross-cut west for 332 feet being put in at the 350-ft. level. At the 427-ft. level the north drive was continued to 54 feet and south to 46 feet on the Streaky Slate, while an eastern cross-cut was put in 80 feet. An intermediate level over the 427-ft. level was driven north 140 feet and south 170 feet. The shaft was sunk to 528 feet, and drives at the 478-ft. level were put in north 100 feet and south 40 feet on the Indicator, but the returns for the year were small, 300 tons yielding 300 oz. 7 dwt. 14 gr.

In 1896, the 572-ft. level was opened. Drives were put in north 65 feet and south 110 feet on the Indicator, and a rise over the south drive at 50 feet from the shaft passed through three payable veins in 28 feet vertical. The cross-cut west was extended to 257 feet from the shaft and a rise on the Western Indicator at 110 feet was put up 69 feet. A cross-cut east passed through a vein showing gold at 70 feet. The veins at the 475-ft. and upper levels proved to be unpayable. For the year, 331 tons yielded 290 oz. 4 dwt. 20 gr. of gold.

In 1897, the ore in sight became poor. The south drive at the 572-ft. level was extended to 195 feet in clean country. The shaft was deepened, the 630-ft. level was opened, and a cross-cut was driven to the Indicator, on which a drive south was put in 60 feet. Work ceased in July, 1897, and the 572-ft. level was not re-opened till 1909.. (See p. 247.)

### LAST CHANCE COMPANY.

The Last Chance Quartz Mining Company, Specimen Gully, was formed in 1859; a battery of 8-heads of 6 cwt. each was erected, and crushing began during the year. All expenses were wiped off, and dividends were paid by the end of 1859. Two shafts were in use; the main shaft at the side of the main road was connected with the battery by a tramway. Regular dividends of £6 to £10 per share were paid in 1860. As the ground at the main shaft was very heavy, a new shaft was sunk in August, 1860; several veins were cut, and at 150 feet the main level was opened out to cut the reef worked in the former shaft. After the dead work had been completed, driving and stoping were resumed in January,

1861, and dividends were again paid. At the 100-ft. level a reef 6 ft. wide was cut west of the shaft, and another, 8 ft. wide, on the east side. At the 150-ft. level the reef was 10 ft. wide. The yields, though payable, were small until April, 1861, when a better run of stone was met; this did not continue for long, however, and by August the mine was barely affording wages to the shareholders.

The published yields include:—

| Month ending. | Quartz Crushed. | Gold per Ton. | Depth. |
|---|---|---|---|
| | tons. | dwt. gr. | feet. |
| August, 1860 .. | 250 | 6 12 | 40 |
| September, 1860 .. | 310 | 4 12 | 40 |
| July, 1861 .. .. | 400 | 4 0 | 70 |
| October, 1861 .. | 500 | 5 0 | 100 |
| November, 1861 .. | 400 | 5 0 | 150 |

LLANBERRIS COMPANY.

This company was almost the first to mine quartz at Ballarat, and was, in fact, the first to treat the matrix successfully. The company, which was formed in September, 1858, consisted of sixteen shareholders, and had power to make unlimited calls. An area, measuring 700 feet north and south along the line of lode by 500 feet east and west, was secured under a miner's right title on Gum Tree Flat, near the confluence of the Red Streak, Canadian, and Red Hill leads. Three lodes traversed the area. The Eastern lode in one place rose above the bedrock into the alluvial like a perpendicular wall, 18 feet high, along which the deep leads were followed until a depression in the reef allowed the junctioned leads to pass over to the west. It was the knowledge of the existence of this reef in the alluvial that led to the formation of the company.

Quartz crushing began in September, 1859. The battery consisted of two boxes with four stampers in each; the stamp-heads and shaft weighed 5 cwt. each, and reduced about half a ton per head every 24 hours.

A main shaft, 225 feet from the northern boundary of the claim, was sunk 198 feet by September, 1859, and the 194-ft. and 175-ft. levels were opened out. In the 175-ft. level the Eastern lode was 45 feet east of the shaft, and proved to be from 12 to 40 ft. wide; drives were put in for 600 feet together with rises from 7 feet to 30 feet up to the alluvial, near which the cap of the reef was in places 70 ft. wide. North from the shaft at this level a drive was put in 250 feet along what was known as the Middle lode, which varied from 2 ft. to 6 ft. wide. The reef was stoped to the surface of the bedrock, which was within 10 feet. of the back of this level. The Western lode, which varied from 2 ft. to 12 ft. wide, was 40 feet west of the shaft; it was driven on north to the northern boundary of the claim, but south, like the Middle lode, it was broken and irregular. Near the southern boundary of the claim a second shaft was sunk to test the extension of the lode then being worked in the adjoining Enterprise claim; this shaft bottomed at 120 feet, and the 200-ft. level was opened out.

In 1861, the company found that the battery was inadequate to deal with the low-grade ore, and twelve heads of stampers were added at a cost of £300. With increased crushing capacity, the average weekly output of gold rose to 70 oz., and dividends were regularly paid. For twelve weeks ending 20th July, 1861, the gold yield was 770 oz. 11 dwt., valued at £3,031; the expenses £600; and the profit £2,451; the lowest yield for a week during this period was 39 oz., and the highest, 97 oz. The quantity of ore crushed averaged 130 tons per week, and crushing was confined to one shift. Shortly afterwards, the value of the quartz mined began to fall away, and to the end of 1861 the average yield per week was under 40 oz.; this, however, enabled the company to pay small dividends.

The total output to 16th May, 1863, was 4,802 oz. of gold valued at £19,043; and the total dividends, £5,920. By the end of the year, the company had won 6,391 oz. of gold valued at £25,459, and paid £9,052 in dividends, the output for the year being 2,623 oz., valued at £10,584. The average yield of the quartz treated in 1863 was 8 dwt. 5¾ gr. to the ton.

During 1864 a drive was put in south along a vein dipping 45 deg. to 60 deg. west. This drive connected with the Enterprise Company's workings. The main shaft was sunk to a depth of 250 feet by August, 1864. In October the co-operative company was wound up, and a registered company of 2,000 shares was formed. The co-operative party had won 8,213 oz., valued at £28,740.

The new company purchased from Messrs. Learmonth Brothers the claim (800 feet along the line of lode), plant and machinery of the New Enterprise Company for £3,500; the workings were connected, and the southern portion of the claim was mined from the Enterprise shaft at a depth of 300 feet, and from the Llanberris shaft at 250 feet.

The gold yield from December, 1864, to December, 1865, amounted to 2,677 oz., valued at £10,893, and £2,050 was paid in dividends. During the quarter ending November, 1865, 4,608 tons of quartz yielded 928 oz. of gold, an average of 4 dwt. to the ton, and the dividends for the same period amounted to £1,800 or 18s. per share. The whole of the quartz mined during 1865 was crushed at the Enterprise battery, the plant at the Llanberris shaft having been sold in August of that year.

During 1866 the stone crushed became poorer, and by the end of the year it averaged only 2½ dwt. of gold per ton.

In 1867 prospecting operations south of the main shaft revealed large bodies of payable quartz at shallow levels. The company now possessed three shafts, the main (Enterprise), the Llanberris, and the old Llanberris No. 2. The main shaft was 620 feet from the southern boundary of the mine, and was 300 feet deep. At this level a drive 800 feet northwards passed under all the workings of the Llanberris shaft, which was only 225 feet in depth, and lay 665 feet north of the main shaft. Mining operations were confined to the belt of country between the main shaft and the old Llanberris shafts; this area was under the main alluvial gutter.

In the northern part of the mine three lodes were worked, but opposite the Llanberris shaft the Middle lode died out, although the Eastern and Western lodes were well defined down to the deepest level worked. The Eastern lode in the upper workings varied from 12 ft. to 40 ft. wide, and the cap of the lode for a length of 200 feet was as much as 70 ft. wide. At the 300-ft. level the veins and leaders extended over 70 ft. in width, all of which was stripped and sent to the mill, more than half being quartz. The quartz was much disordered, and formed in some places a series of almost horizontal veins, one above another. Towards the south boundary, at a depth

of 150 feet, some ore of good value was met with, and mined from the 200-ft. level at the main shaft.

During 1868 the year's operations were confined to above the 300-ft. level. The Eastern reef and adjacent spurs to the west yielded a large quantity of ore. The workings in the southern part of the mine failed to locate the continuation of the rich stone met with in the previous year. Much poor quartz was crushed during the year, but good payable flat leaders west of the main lode were met with. The pyrites, by the end of the year, was becoming of value, and steps were taken to save it.

In 1869 shaft-sinking below the 300-ft. level commenced about the beginning of the year, and most of the mine was let on tribute. Before the end of the year the 400-ft. level was opened out, and cross-cutting started for the reef. Low-grade ore was mined throughout the year.

In 1870 the reef was intersected at the lower level early in the year, and proved to be from 8 ft. to 9 ft. wide, but very poor. The tributers opened up abundant low-grade ore north of the old Llanberris shaft during the year. Gold-bearing veins were found near the lode at the 400-ft. level, but nothing payable was located. During this year the tributers mined over 80 per cent. of the quartz crushed. The ore was low grade, large crushings averaging at times under 2 dwt. to the ton. After extending the 400-ft. level 140 feet north on the lode, from which several unpayable crushings were taken, rises were put up to connect with the 300-ft. level, where the former company had opened up payable stone.

Early in 1871 the general outlook at the mine improved. At the 200-ft. level a payable leader was found, and the large bodies of ore were payable, though not rich. Throughout the year the tributers carried on most of the work. From the 400-ft. level a blind shaft was sunk to a depth of 100 feet, and a level was put in to strike the lode.

In 1872 the gold yield fell to under 2 dwt. to the ton, and for the half-year ending November, 1872, 4,562 tons yielded only 429 oz.

In 1873 operations south of the main shaft resulted in the opening up of a large extent of payable ground at the 200-ft. level. These workings were confined to tributers whose yields throughout were very poor. For the half-year ending May, 1873, 5,128 tons yielded 410 oz. During the year a party of tributers extended the 300-ft. level north to work the veins on the western side of the lode, as these were known to carry gold, and though the ore carried under 2 dwt. of gold to the ton, the results were payable.

In 1874 the value of the stone improved slightly. The quartz veins were on the western side of the main lode, at about 90 feet below the surface and 300 feet south of the Joss shaft. During the year prospecting was continued at the 300-ft. level, the south drive on the lode was extended 256 feet, and cross-cuts were put in east and west without locating payable ore. Several small crushings from the 400-ft. level were unpayable, and work was suspended at this level. Before the end of the year the quartz mined was very poor, averaging under 2 dwt. to the ton. During the year the average output was over 2,000 tons of quartz per month.

In 1875 seven tribute parties worked in the area; the deepest workings were at 300 feet. The stone mined was low grade, and consisted largely of leaders. At the 200-ft. level a drive towards the Red Streak shaft was put in for over 700 feet before the end of the year. A south drive at the same depth was over 1,300 feet in length. The yield for 1875 was over 1,000 oz. less than that for 1874.

In 1876 the main drive at the 200-ft. level was connected with the Red Streak shaft, and was continued further south than the Red Streak workings for a total distance of over 1,600 feet from the Llanberris main shaft. The south drive to connect with the prospecting shaft 1,500 feet south of the main shaft was continued. An east cross-cut at the 200-ft. level was driven through the strata east of the Indicator till the boundary of the claim was reached. The tonnage of ore crushed was smaller, but the yield was the same as that for the preceding year.

In 1877 work was resumed at the 400-ft. level, where a drive was put in east for the Red Streak lode, and the Indicator. Several portions of the old workings were tested, but proved unremunerative, although ore in abundance was located. The ground south of the Red Streak shaft was found to be valueless. The chief work of the year was carried out above the 200-ft. level.

In 1878 Bushby's tribute party located payable stone in the north end, and this was worked north and south. The 400-ft. level was swamped in May, and remained so during the rest of the year.

From 1879 to 1885 tribute parties worked the ground chiefly at the shallow levels, the deepest workings being at 300 feet. The yields were low on the average, but at times were highly profitable to some of the parties. A small percentage of pyrites was saved. This yielded from 1½ oz. to 3 oz. to the ton.

Towards the end of 1886 Robert's lode was struck at the 400-ft. level, and a large quantity of low-grade stone was opened up. The Red Streak shaft was repaired to the 400-ft. level in the same year. Various tribute parties still worked payable, though low-grade, stone in the upper levels, but the half-yearly reports till the close of 1890 contain few details of operations.

In 1887 the Red Streak shaft and the adjacent ground were handed over to a new company known as the Llanberris No. 1 (see p. 223) which paid tribute to the Llanberris company.

### No. 3 Shaft Workings.

No. 3 shaft on the Sulieman line was sunk to a depth of 620 feet, and during 1894 cross-cuts were driven at the 500-ft. and 600-ft. levels. The 500-ft. level cross-cut reached the line of quartz that had been worked by means of a winze from the 400-ft. level of No. 2 shaft, and a north drive was put along the lode, which averaged 3 dwt. 2 gr. of gold to the ton. Stoping in a large body of low-grade quartz began in 1895, and continued till early in 1897. The north drive was extended to 578 feet, and 3 rises from it struck quartz, the highest yield from which was 11 dwt. 18 gr. of gold to the ton. The 600-ft. level east cross-cut intersected the lode at 245 feet, and in the north drive the stone was poor and small to 245 feet, where work ceased at this level in August, 1895.

Early in 1896 driving was resumed in softer ground for 100 feet, making the total 345 feet from the cross-cut. This drive was continued to 708 feet without meeting payable stone, though several spurs were passed through in the last 100 feet of driving and cross-cuts were put in east and west. At 11 feet east of the quartz in the main drive a rise was put up which struck a large body of gold-bearing quartz at 20 feet above the level; a crushing of this yielded 6 dwt. to the ton, but when stoped the ore was not found to be so good,

and, early in 1898, it became unpayable and the shaft was closed down.

No. 4 Shaft Workings.

In 1893 No. 4 shaft was sunk to a depth of 609 feet, and the tributers opened out the 550-ft. and 600-ft. levels to the Indicator. Main drives north and south proved strong bodies of payable quartz early in 1894. Towards the end of 1894 the shaft was deepened to 669 feet. No. 3 cross-cut (660-ft. level) was opened west of the Indicator, where a rise was put through to No. 2 level. It passed through two small veins carrying gold, which drives north and south for 70 feet proved to be payable. The main cross-cut west was extended to 312 feet. In 1895 the shaft was deepened, and the 720-ft. level struck payable quartz on the Pencil Mark towards the end of that year. The veins on the Indicator were poor, and work at this depth ceased in 1896.

Nos. 1 and 2 (500-ft. and 600-ft.) levels on the Indicator were poor in 1895, and in August, 1896, work was suspended at both. In 1896 the 350-ft. level was opened up, and a cross-cut was driven west through the Indicator to the Western Slate country where strong makes of quartz carrying a little gold were found. On the Pencil Mark and the Indicator stoping and driving south were carried on by tributers, who worked on veins which were payable at times until early in 1898, when the stopes were exhausted and the shaft was closed down.

After 1903 a few tribute parties worked at shallow levels. The company is still in existence (1914).

The following yields were recorded:—From 1861 to 1864, 8,212 oz. 8 dwt. 17 gr., value £28,740 0s. 7d.

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons | oz. | dwt. | gr. |
| 1864[1] .. .. | 2,555 | 831 | 0 | 5 |
| 1865 .. .. | 3,631 | 2,242 | 16 | 0 |
| 1866[1] .. .. | 20,556 | 3,196 | 18 | 6 |
| 1867 .. .. | 22,224 | 3,815 | 5 | 10 |
| 1868[1] .. .. | 13,516 | 2,105 | 0 | 0 |
| 1869 .. .. | 11,061 | 1,437 | 13 | 8 |
| 1870 .. .. | 8,718 | 848 | 9 | 0 |
| 1871 .. .. | 9,689 | 1,172 | 12 | 12 |
| 1872 .. .. | 14,818 | 1,636 | 5 | 0 |
| 1873 .. .. | 23,700 | 2,034 | 11 | 8 |
| 1874 .. .. | 24,390 | 2,736 | 14 | 2 |
| 1875 .. .. | 21,042 | 1,701 | 2 | 0 |
| 1876 .. .. | 16,948 | 1,700 | 10 | 3 |
| 1877 .. .. | 7,289 | 574 | 13 | 6 |
| 1878 .. .. | 8,275 | 902 | 6 | 0 |
| 1879 .. .. | 8,859 | 1,150 | 14 | 5 |
| 1880 .. .. | 10,812 | 1,006 | 2 | 18 |
| 1881 .. .. | 7,396 | 738 | 10 | 13 |
| 1882 .. .. | 5,353 | 426 | 19 | 14 |
| 1883 .. .. | 2,476 | 372 | 5 | 16 |
| 1884 .. .. | 4,522 | 734 | 10 | 0 |
| 1885 .. .. | 6,187 | 1,553 | 14 | 12 |
| 1886 .. .. | 7,688 | 1,445 | 0 | 12 |
| 1887 .. .. | 11,304 | 2,779 | 19 | 9 |
| 1888 .. .. | 6,273 | 2,152 | 16 | 3 |
| 1889 .. .. | 4,438 | 1,791 | 1 | 15 |
| 1890 .. .. | 5,846 | 2,294 | 2 | 3 |
| 1891 .. .. | 8,585 | 4,316 | 8 | 7 |
| 1892[2] .. .. | 3,448 | 1,285 | 19 | 9 |
| 1893[2] .. .. | 9,624 | 1,754 | 19 | 6 |
| 1894 .. .. | 18,430 | 5,649 | 9 | 3 |
| 1895 .. .. | 11,782 | 1,941 | 8 | 1 |
| 1896 .. .. | 4,931 | 1,126 | 9 | 0 |
| 1897 .. .. | 5,046 | 1,127 | 8 | 3 |
| 1898 .. .. | 2,200 | 1,307 | 4 | 0 |
| 1899 .. .. | 1,353 | 308 | 11 | 0 |
| 1900 .. .. | 1,287 | 433 | 4 | 0 |
| 1901 .. .. | 466 | 104 | 13 | 0 |
| 1902 .. .. | 1,757 | 392 | 19 | 0 |
| 1903 .. .. | 114 | 21 | 19 | 0 |
| Total .. | 358,589 | 63,152 | 4 | 17 |

[1] Nine months. [2] Six months.

MAZEPPA COMPANY.

This company was formed in 1879. By working the Indicator veins, some rich yields were obtained. Early in 1880, an average of over 5 oz. to the ton was won from flat veins at a depth of 102 feet. Towards the end of the year the mine was let on tribute, and the shaft was sunk to a depth of 230 feet, where two veins showing gold were met with. Drives were extended north and south on the Indicator. The veins proved small but of good quality, 8 tons yielding 18 oz. 13 dwt. In April, Baker and party (tributers) surrendered their agreement, and this portion of the mine was relet to Richards and Caldecot. Fair quality ore was obtained till June, when a new vein was struck over the back of the drive, from which 25 oz. of gold was nuggetted out. Shaft sinking was resumed, and, in August, two gold-bearing veins were intersected at a depth of 265 feet.

This mine was afterwards worked by the Indicator Company (see p. 247).

NEW BURRA BURRA COMPANY.

The New Burra Burra Company sank its shaft in 1880. At a depth of 320 feet, the first "floor" of the Washington reef was intersected: at this point, in a depth of 6 feet, were several flat veins of quartz, some portions showing gold very freely. These veins were followed north and south, and for a height of 70 feet above the level. The first half-year's crushing yielded 1,415 oz. of gold from 1,770 tons. By the end of 1880, the second level (410 ft.) was opened; at this depth the run of gold-bearing spurs was 40 feet east of the upper level. Drives were put in to the north and south boundaries of the lease, and stoping was carried out. By the end of 1881, the crushings were small and poor, and, for the last six months of the year, 264 tons yielded 46 oz. 16 dwt. of gold. The shaft was sunk deeper, and, in 1882, the 485-ft. level was opened with cross-cuts to the east. At 26 feet over this level a flat vein was struck and worked to the south boundary, but it proved unpayable. A cross-cut west was put in to the boundary. At the 410-ft. level an eastern cross-cut was put in 400 feet; at 392 feet it intersected a reef 1 ft. wide, along which a drive was put in for 30 feet south in black slate country with well-defined walls. At 70 feet east of the shaft a rise was put up 140 feet without locating payable stone. At a depth of 271 feet in the shaft a drive was put in north 28 feet, and from the end of this a west cross-cut was driven to the boundary; a large body of quartz was found in this drive, and was followed for 70 feet, but no payable ore was disclosed. From a rise of 50 feet over this level unpayable veins were followed to the boundary of the claim. An eastern cross-cut at the 271-ft. level was driven 154 feet to the eastern wall, and was connected with the 320-ft. level by a winze on a small make of quartz. After much unprofitable searching operations ceased in 1883. The recorded yields are:—

| Quarter ending— | Ore Crushed. | Gold Yield. | | | Depth. |
|---|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. | feet. |
| September, 1880 .. | 1,322 | 1,134 | 14 | 12 | 300 |
| December, 1880 .. | 536 | 385 | 12 | 0 | 380 |
| March, 1881 .. | 1,084 | 334 | 19 | 0 | 360 |
| June, 1881 .. .. | 919 | 202 | 15 | 0 | 400 |
| September, 1881 .. | 264 | 46 | 16 | 0 | 400 |
| June, 1882 .. .. | 367 | 117 | 0 | 0 | 400 |
| September, 1882 .. | 578 | 149 | 6 | 0 | 300 |
| December, 1882 .. | 271 | 97 | 0 | 0 | 300 to 400 |

Dividends amounting to £2,475 were paid during 1880.

PRATT'S FREEHOLD COMPANY.

Pratt's Freehold Company held a claim near the Kohinoor Company's boundary. The shaft was sunk to a depth of 450 feet in 1880-1882, but disclosed nothing of promise. The reef country was abandoned, and a search was made for alluvial above the 300-ft. level.

NEW SPEEDWELL COMPANY.

This company, consisting of 24 shareholders, held a claim on Poverty Point reef, formerly belonging to the Speedwell Company (see p. 159). Early in 1863 crushing began on quartz which came from the 220-ft. level. Other levels were being tested at depths of 160 feet and 210 feet. Two lodes were disclosed, the Eastern, which was the one worked, dipped westerly at 1 ft. in 3 ft., and was from 10 ft. to 20 ft. wide, and the Western, which, so far, was of poor quality. Driving along the Eastern reef cross-courses were met with both north and south of the shaft, and the lode was found to be improverished when again located. Few records of the company's workings are now available.

The yields recorded are:—

| Period. | Ore Crushed. | Gold Won. | Remarks. |
|---|---|---|---|
| | tons | oz. dwt. gr. | |
| January to June, 1863 .. | .. | 601 19 12 | |
| Quarter ending March, 1864 .. .. | 1,350 | 238 0 0 | From 200-ft. level |

Including the yield from the Speedwell Company the total yield to June, 1863, amounted to 1,956 oz. from 8,061 tons.

NEW SIR WILLIAM DON COMPANY.

The New Sir William Don Quartz and Alluvial Company was formed early in 1880. The Sir William Don Company's shaft (see p. 96) was cleaned out to a depth of 103 feet, where heavy water was struck; then an abandoned shaft of the New Kohinoor, and also the old Privateer Company's shaft, were tried, but the water proved too heavy in each case. A new shaft, on the west side of the old Don shaft, passed through 122 feet of basalt, and bottomed at that depth; the sinking was dry to 172 feet, but at this depth water was struck. Machinery was then erected, and the shaft was continued to a depth of 205 feet. At this depth a cross-cut was put in east for 113 feet, with a branch drive 134 feet to the south-east; a bore from the face proved wash at 62 feet above the level; the drive was then continued for 60 feet, where cemented wash was struck at 28 feet over the back. Drives totalling 425 feet were put in along this wash, which proved poor, and all work below ceased in August, 1882.

NORTHERN STAR COMPANY.

The company was formed in October, 1886, to work the Guiding Star line of lode immediately north of the Band and Albion No. 9 shaft. The capital was £48,000, in 24,000 shares of £2 each. The first shaft was started between Ripon and Pleasant streets; it was sunk to 92 feet in basaltic rock, and then abandoned, as the windlass could not cope with the water.

A new shaft was started in January, 1887, about 1,400 feet further east, and nearer the Star of the East line of lode, which was then giving rich returns in the Star of the East mine. The sinking was through basalt; water-level was at 80 feet, and the base of the first rock at 88 feet. On reaching this depth, the shaft was puddled up. The second rock, which continued to 177 feet, was quite dry. At 181 feet the shaft bottomed on bedrock. At a depth of 500 feet a cross-cut was opened to the lode in 1887, and a drive south was put in. Shaft sinking was continued, and the 700-ft. level was opened before the close of 1888. More machinery was installed, and preparations were made for further sinking, but operations ceased early in 1889, during a period of depression, and the mine lay idle for six months.

On resuming operations in June, 1889, a pumping engine was erected, and the shaft was deepened to 873 feet, but work again ceased owing to many shareholders not paying calls and forfeiting their shares.

In April, 1890, the shares were taken up, and sinking was resumed. A level was opened at 905 feet, but as the lode here was much broken, further sinking was undertaken. By the end of 1890 a depth of 1,105 feet was reached, a plat being cut at the 1,005-ft. level, and driving north and south on the lode being carried out while sinking proceeded. Before the end of 1891 the shaft was 1,323 feet deep; sinking was then suspended pending the driving of a cross-cut at the 1,250-ft. level, and also of driving on the lode at the 1,105-ft. level.

In 1893 a pumping plant was installed, the shaft was sunk an extra 50 feet, and the 1,350-ft. level was opened out. During the latter part of the year 200 feet of plunger columns were fixed in the shaft, and water was pumped from the bottom. The west cross-cut, at the 1,350-ft. level, was extended to 186 feet in 1894, but as drives north and south failed to locate payable ore, this level was abandoned early in 1895, and attention was confined to extending the west cross-cut at the 1,250-ft. level, which reached a total distance of 2,450 feet in October, 1896.

Very little prospecting was carried out on the various lode-tracks passed through, and, after a dam had been built in the cross-cut, operations were confined to the Guiding Star line of lode at this and shallower levels. During the latter part of 1898, 2,400 shares were forfeited by their owners and purchased by the company, which then held 4,475 shares. Although extensive and systematic prospecting was carried on, nothing of value was located, and the mine was let on tribute in 1899 to Bennett and party, who prospected at shallow levels until September, 1904, when the company was wound up.

The details of the various levels are as follow:—

*500-ft. Level.*—In 1888 the east cross-cut at the 500-ft. level cut the lode at 60 feet from the shaft. Drives were put in along the course of the lode north 500 feet and south 120 feet; the quartz ranged from 6 in. to 1 ft. wide, and occasionally carried a little gold, but not in payable quantities, consequently driving at this level was discontinued.

*600-ft. Level.*—In 1888 a chamber was cut at the 600-ft. level, and a cross-cut was driven east 36 feet to the lode. Drives were opened on the lode for 300 feet north and 250 feet south in solid quartz, well defined, and averaging from 1 ft. to

2 ft. wide; these drives failed to prove any payable ore, and work at this level was discontinued. In 1889 a lode was intersected at 30 feet east of the main lode, and drives were opened out on it for 570 feet north and 270 feet south on ore averaging from 1 ft. to 3 ft. wide.

*1,105-ft. Level.*—In 1892 operations were confined to driving and cross-cutting. The drive north on the course of the lode at this level had reached a distance of 713 feet from the cross-cut, and the lode in the face was more defined and better in appearance than elsewhere. During 1899 a rise was put up 134 feet, but, as the country was hard, work was suspended at this level.

*1,250-ft. Level.*—During 1892 the cross-cut at the 1,250-ft. level intersected the lode at 98 feet from the shaft, and a south drive on the course of the lode was put in about 40 feet, but was then stopped owing to the large amount of water coming in from the west side. The cross-cut was extended west for the purpose of ascertaining whether another parallel lode existed, but only small veins of quartz were found, each giving out a flow of water and only one showing gold. When the last vein was cut at 196 feet, the water became so strong that baling for a couple of days was required to overcome it, and a bore-hole, which was put in from the face, so increased the flow of water that work had to be suspended. As the tanks were unable to cope with the water, a new boiler and pumping engine, bob and all mountings complete, were installed during the year.

In 1893 a contract was let for putting in pumps. The water was taken out of the shaft, and work was resumed at the 1,250-ft. level. The west cross-cut, at the 1,250-ft. level, was extended 294 feet; this carried the face 494 feet from the shaft. A drive was opened out north on a make of quartz that had been passed through in the cross-cut; this carried galena, black-jack, and gold, but was hardly payable, although the gold was a splendid sample.

In 1894 the west cross-cut, at the 1,250-ft. level, was driven to 1,119 feet from the shaft through very hard and tight country. The north drive was extended to 395 feet on the course of the Guiding Star lode, 200 feet of that distance being in solid quartz. This drive was started 12 feet west of the footwall on flat leaders showing a little gold; 130 tons of this quartz was crushed for a return of 36 oz. 13 dwt., an average of over 5 dwt. to the ton, pyrites included. A rise was put up 31 feet from the back of this drive on flat leaders carrying a little gold, but not sufficient to pay, owing to the tightness of the ground. The 200 feet of quartz through which the north drive passed was well-defined, and had a good footwall. After passing through this stone, the drive intersected a cross-course and a slide, which connected and continued for 70 ft., where the footwall was again found; it was settled and defined with clean country on the west side and a bar of solid pyrites from 8 in. to 9 in. thick. In the slate, at the end of the cross-cut, were flat leaders carrying galena and black-jack.

In 1895 the main cross-cut west was extended to 1,665 feet. At 1,240 feet from the shaft a body of quartz of promising appearance, and 3 ft. wide, was intersected. At 1,410 feet from the shaft was a large body of quartz known as the Extended lode, well mineralized and showing a little gold, and at 1,610 feet a small vertical lode-track with good walls, but carrying no quartz. A prospecting drive was put in on the Extended lode for 50 feet north, and was then stopped as the lode did not improve.

During 1896 the main cross-cut west was extended to 2,450 feet from the shaft in slate and sandstone country, intermixed with both vertical and flat leaders. On the lode at 1,410 feet from the shaft drives north 74 feet, and south 16 feet, were driven; the north drive was in quartz from 12 ft. to 14 ft. wide, a trial crushing from which yielded 3½ dwt. to the ton. At 1,765 feet west of the shaft a lode 2 ft. 6 in. wide was intersected; it was well mineralized, and gave out a good flow of water. Drives were opened out on this lode north for 80 feet and south 16 feet, the lode proving small, but with two well-defined walls. A trial crushing yielded 1½ dwt. of gold to the ton. At 2,450 feet west of the shaft a lode, the Albion, was intersected; it carried quartz 4 ft. to 5 ft. wide, with a good footwall, but drives opened for 34 feet north and 60 feet south failed to prove any favorable development, and were, therefore, stopped. The directors then decided to dam back the water at this level, and to confine operations to the Guiding Star lode. With this object in view, a rise was put up in 1896 on the footwall of the lode at 72 feet north of the cross-cut, and in this rise, at 41 feet up, the lode was found to carry 3 feet of fair-looking quartz on the footwall.

In 1897 the work at the mine was confined to the 1,250-ft. level, and prospecting was carried out on the Guiding Star lode, the north drive having been extended to 540 feet from the cross-cut. Four cross-cuts were put out west of the drive to test the hanging-wall country. The rise begun in 1896 was connected with the 1,100-ft. level. At 80 feet up the rise there were some bunches of quartz heavily charged with mineral and carrying a little gold, but not in payable quantities. A drive was opened off this rise and driven 231 feet north and 20 feet south on a well-defined lode.

In 1898 the Guiding Star lode was further prospected, and the north drive was extended 1,156 feet from the main cross-cut. At about 100 feet south of the present face small unpayable dish-prospects of gold were obtained. Cross-cuts were put out to test the hanging and footwalls.

*1,350-ft. Level.*—During 1893 a chamber was cut at the 1,350-ft. level, and a cross-cut was opened out west and driven 30 feet from the shaft.

In 1894 the west cross-cut was extended to 186 feet from the shaft; at 156 feet it intersected the lode, and passed through solid quartz, 24 ft. wide, without revealing any gold. A drive was opened out 162 feet south along the footwall of the lode in order to cut the shoot of gold worked in the level above; it was in solid quartz for the full width of the drive all the way. No work was carried out at this level after early in 1895.

### NORTH KOHINOOR COMPANY.

The North Kohinoor Company started in 1880, cleaned out and enlarged the shaft of the Great Eastern Company, and installed pumping machinery. At a depth of 400 feet cross-cuts east 68 feet and west 26 feet were put in without meeting any quartz of value. The shaft was deepened to 515 feet, and a plat was cut at the 505-ft. level. Timber 8 in. x 6 in. was required for the shaft, and the 12-in. pump was worked at seven strokes of 5 feet per minute to cope with the water.

In the east cross-cut, at the 400-ft. level, a few leaders carrying occasional colours of gold were found at from 70 feet to 150 feet; these leaders pitched north and dipped east. A winze was sunk on this run of country, and passed through a few more veins in a depth of 25 feet.

At the 500-ft. level the strata passed through in the east cross-cut were very hard. A cross-course was struck in this level; it was driven on for 508 feet from the shaft (that is, as far as the western edge of Lyons-street), but no quartz was found. Two drives put in northerly from the cross-cut were also unsuccessful. In December, 1882, work ceased at the 500-ft. level, and the old alluvial company's drive at the 320-ft. level was cleaned out and repaired in the search for reef-wash. After a length of 400 feet of the level had been repaired, and no encouraging indications found, work ceased early in January, 1883. At this time the pumps had to be kept going for 10 hours per diem.

### NORTH PRINCE REGENT COMPANY.

This company was formed in September, 1889. The shaft was sunk to 536 ft., where it was stopped on account of difficulties with water.

*520-ft. Level.*—At the 520-ft. level a cross-cut was extended west; at 56 feet it intersected a body of gold-bearing quartz, along which drives were opened north and south. An easterly cross-cut of 52 feet at the same depth failed to locate any ore.

In 1892 a formation further west was found to be of fair quality; it was opened for a length of 370 feet by a width of 30 feet, and was payable throughout. A winze of 50 feet sunk from the drive went through payable ore.

In 1893 the stopes over the level extended the full length of the mine, averaged 60 ft. wide, and were 70 ft. high at the south end. These stopes were exhausted in 1894, but a rise from the south drive proved a new formation at 90 feet above the level; this was stoped to a height of 127 ft. during 1895. In the east cross-cut some small veins hitherto untried were proved payable during 1895.

Towards the end of 1890 the shaft was sunk below 526 feet, and in a depth of 60 feet it passed through three gold-bearing veins, one 3 ft. and one 8 in. wide.

*580-ft. Level.*—The 580-ft. level was opened out in 1891. Drives were put in north and south from the shaft to work the veins found in sinking, and a cross-cut east passed through quartz 5 ft. wide. The south drive, for 206 feet, carried a large body of ore, which yielded 4 dwt. of gold to the ton, but was unpayable. In 1891 the west cross-cut, at 78 feet, intersected a formation of considerable extent, carrying 12 dwt. of gold to the ton. In the drive north the ore improved as far as a cross-course, which displaced the lode east and underfoot. In 1892 the west cross-cut was extended 326 feet to reach the large formation that had been proved in the level above; it passed through several quartz veins, and connected with the winze from the 520-ft. level. An intermediate level from the winze intersected quartz at 24 feet west; drives were put in for 250 feet north in payable ore and for 80 feet south.

From the cross-cut at the 580-ft. level a north drive on the track of the lode passed through the cross-course into payable ore; at 155 feet south from the cross-cut it was not payable, but payable ore was driven on for 80 feet, and stoping was carried out. In 1898 this cross-cut was cleaned out and extended to 365 feet, but it passed through only two small veins.

*400-ft. (No. 4) Level.*—In 1892 Nos. 4 and 5 levels were opened. At No. 4 level a drive was put in south, and a rise was put up to cut veins passed through in the shaft; these veins yielded 16 dwt. of gold to the ton, where cut, but they were too small to be worked profitably. A cross-cut west at 111 feet south of the shaft intersected a body of unpayable quartz 9 ft. wide, which did not improve in the drives, which were extended north and south. Work at this level ceased in 1893; in 1897, however, the level was re-opened, and a drive was put in south, but cross-cutting and rising failed to disclose any payable formations.

*460-ft. (No. 5) Level.*—At No. 5 level drives and rises failed to locate any stone during 1892 and 1893. In 1895 this level was re-opened to work the formation stoped above the 520-ft. level. For this purpose a south drive of 40 feet, and a cross-cut of 100 feet, were put in, and a rise of 40 feet was put up to meet the stone. In the south drive between 40 feet and 224 feet from the shaft payable quartz was found and stoped in 1891. Two winzes below the level opened up a length of 130 ft. of payable stone in 1897.

*640-ft. (No. 8) Level.*—No. 8 level was opened in 1894. A cross-cut east for 40 feet passed through small veins of no value. The west cross-cut, at 50 feet, intersected a body of quartz on which drives were extended north and south. The south drive for 185 feet carried payable quartz; in the north drive for 143 feet the lode was large and poor, but at 180 feet and 198 feet it improved in quality, and was stoped above the level with fair returns in 1895. The veins worked in 1896 were smaller; they continued to be payable in the south drive, but in the north drive they were poor. Early in 1896 a large body of payable ore was found in the north stopes, and was worked out. Prospecting by driving, rising, and cross-cutting failed to locate any further bodies in 1898. During 1899 a little stoping was undertaken on veins which were not payable owing to their small size, though they carried ore of good quality. A small block of payable stone was worked on the north boundary, towards the end of 1899.

*700-ft. (No. 9) Level.*—No. 9 level was opened in 1895. The west cross-cut, within 18 feet of the shaft, passed through several veins, one 1 ft. 6 in. thick. Two winzes from the 640-ft. level proved the veins to extend to within 30 feet of this drive, and stoping was carried out. In 1897 the west cross-cut was extended to 119 feet, where it intersected a vein 1 ft. wide, which yielded 12 dwt. of gold to the ton. This quartz was on the "Big Slate"; a drive 100 feet long proved that the ore was unpayable. The north drive was put in 87 feet without locating any payable stone.

*760-ft. (No. 10) Level.*—In 1899 a cross-cut was put in west at 760 feet; at 132 feet it passed through a poor formation 2 ft. wide. Drives were put in on an irregular lode on the 4-ft. Slate. A drive north was extended for 32 feet from the shaft, and a rise of 30 feet from the end of this disclosed quartz carrying coarse gold; at 28 feet south of the shaft a rise of 15 feet proved poor

stone. Operations ceased in 1900, but were resumed in 1903 by the South Woah Hawp Company (see p. 244). The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons | oz. | dwt. | gr. |
| 1890 (1 quarter) | 1,895 | 403 | 12 | 6 |
| 1891 .. .. | 3,808 | 869 | 1 | 0 |
| 1892 .. .. | 11,123 | 3,797 | 10 | 14 |
| 1893 .. .. | 11,625 | 3,328 | 16 | 6 |
| 1894 .. .. | 10,485 | 2,482 | 11 | 18 |
| 1895 .. .. | 8,529 | 2,702 | 19 | 23 |
| 1896 (3 quarters) | 5,290 | 1,722 | 12 | 0 |
| 1897 .. .. | 3,103 | 1,097 | 2 | 14 |
| 1898 .. .. | 1,344 | 587 | 9 | 3 |
| 1899 .. .. | 1,039 | 399 | 15 | 12 |
| 1900 (2 quarters) | 524 | 166 | 12 | 0 |

Dividends amounted to £5,225.

### NORTH PRINCE EXTENDED COMPANY.

This company was formed in 1890 to work an area west of and adjoining the North Woah Hawp Company's claim, and north of Clarke's claim. A shaft was sunk to a depth of 310 feet by the end of 1890, and at 300 feet a cross-cut was put in east 67 feet. Drives north and south on a body of quartz that had been intersected in a shallow level yielded 395 tons of quartz, which returned 124 oz. 17 dwt. of gold; this led the company to install machinery. In 1892, when driving north on this formation was resumed, a cross-course was found; it had a down-throw to the north and a lower level was therefore opened, in which the continuation of the lode was located north of the break. Good values were maintained, but the ore pitched rapidly north, and only a small quantity was available in this level.

In 1893 the shaft was sunk to 600 feet, and the 300-ft., 400-ft., 500-ft., and 600-ft. levels were opened out. At the 600-ft. level a cross-cut, 575 feet west, passed through the continuation of the Sulieman Pasha line of lode at 550 feet from the shaft; the lode at this point was 9 ft. wide, and carried sulphides but no gold. A drive north on this lode was started in 1894, but owing to lack of support, the company ceased work, and nothing has since been done.

In 1894 a cross-cut east was put in at the 400-ft. level to intersect the shoot that went underfoot at the 300-ft. level; this cross-cut was put in 80 feet, above which a rise of 50 ft. passed through several small makes of quartz.

### OLD CANADIAN COMPANY.

The Old Canadian Quartz Company was formed in 1860. The workings consisted of an open cut 40 feet deep and from 80 ft. to 200 ft. wide, a battery of eight stamps crushed 50 tons of quartz per day; the average yield at the end of 1860 was between 5 dwt. and 6 dwt. of gold to the ton, and the weekly dividends varied from £12 to £15 per man. A self-feeding contrivance was attached to the stamp-heads, and proved satisfactory. The highest weekly yield to the end of 1860 was 60 oz., and the lowest 30 oz. Throughout 1861 an average yield of nearly 50 oz. weekly was maintained, the yield per ton being about 3½ dwt.

In 1860, 114 oz. were recovered from 400 tons of ore, and £18 per share was paid in dividends.

The following yields were recorded from 1861:—

| Ore Crushed. | Gold Yield per Ton. | | | Depth. |
|---|---|---|---|---|
| tons. | oz. | dwt. | gr. | feet. |
| 360 .. .. | 0 | 4 | 0 | .. |
| 1,100 .. .. | 0 | 4 | 0 | 50 |
| 800 .. .. | 0 | 2 | 0 | 45 |
| 1,000 .. .. | 0 | 3 | 12 | 45 |
| 1,000 .. .. | 0 | 3 | 2 | 45 |
| 1,000 .. .. | 0 | 3 | 12 | 45 |
| 950 .. .. | 0 | 3 | 12 | 45 |

### OLD POST OFFICE HILL COMPANY.

During 1855 the quartz outcrops on Old Post Office Hill attracted attention. Shafts ranging up to 60 feet in depth were sunk, and by the end of 1859 the mines were well opened up.

Of the earliest parties, Carlsbach and Welford were the most fortunate. A battery of 16 heads, erected at the head of Red Hill gully, crushed for 15s. per ton at this date. A few yields during Decemer, 1859, have been recorded, such as Peake and party, 149 oz. from 100 tons for a week, divided £66 per share; and Bellhausen's party, 54 oz., and divided £16 10s. per share. In January, 1860, Peake and party sold their claim for £3,000 to the Old Post Office Company after four years of highly profitable work.

The Old Post Office Hill Company was formed in 1859, and the claim soon proved to be a steady gold producer, with high average yields from ore easily won. In September, 1860, some fine specimens of gold-bearing quartz were obtained, at that time the finest found at Ballarat; they came from only a few feet below the surface, and the gold in a few pieces weighed 58 oz. From March, 1859, to January, 1860, 3,512 tons yielded 1,116 oz. 10 dwt., an average of 6 dwt. 9 gr. to the ton, and dividends amounted to £233 2s. per man. In 1860, only 883 oz. 10 dwt. (4 dwt. 8 gr. to the ton) was won, and only £157 10s. (£13 2s. 6d. per share) was paid in dividends. During 1861 the quartz was mined chiefly from open cuts, although the companies possessed shafts with quartz proved to a depth of 120 feet. By November, 1861, the numerous claims had merged into two companies —the Old Post Office Hill Company and Tredennick's Company; some of the earlier claims were abandoned and others sold.

The Old Post Office Hill Company, formerly Peake and party, now comprised 27 shareholders, the claim and plant of the German Company were bought, giving the company a total length of over 1,000 feet along the line of lodes. The open cutting works were reached by an incline tunnel starting at the level of the battery. For 1861 the yield was 1,166 oz. 12 dwt., and averaged 3 dwt. 14¼ gr. to the ton. After purchasing claims, &c., the company had a balance of only £229 10s. for division. During 1863 the average yield fell to 2½ dwt. to the ton. In June, 1863, the workings consisted of two shafts, the northern sunk to water-level (160 feet); at 150 feet the lode was cut at 35 feet west of this shaft, and a south drive was put in along the quartz. At the south shaft, 150 feet deep, the 120-ft. and 140-ft. levels were opened, and stoping was in progress above the lower level. An incline tunnel near the centre of the claim was 200 feet long, and attained a depth of 50 feet in that length; drives were extended north and south when the quartz was reached, and the reef was worked from stopes over the drives. In the northern part of the claim the reef was a

solid body of quartz, from 15 ft. to 30 ft. wide, but towards the south it split into two formations, both of which pitched south with a westerly underlie; the eastern body proved to be the richer. Mullock for filling the stopes was obtained from a surface quarry. In September, 1863, two abandoned claims—the Liver and the Wheal Fortuna—were added to the company's holding, giving a total length of 1,350 feet by a width of 1,000 feet. Blocks of ground were let to tributers during the year, and dividends were paid by them. The company began to pay dividends again in November, 1863. The yield for the year was 1,102 oz. 4 dwt. In 1864 the chief work was carried out by tributers with varying results. Up to the 20th August, 1864, the total tonnage crushed was 36,630 tons, the gold yield 6,555 oz., valued at £26,239, and the amount distributed in dividends to the shareholders £4,205 2s. 3d., and £2,184 10s. to the tributers.

The following yields were recorded from 1864:—

| Year. | Ore Crushed. | Gold Yield. | Dividends. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | £ s. d. |
| 1864 .. .. | 9,415 | 1,269 15 0 | |
| 1865 (9 months) .. | 6,295 | 966 9 18 | |
| 1866 .. .. | 9,700 | 1,127 1 12 | |
| 1867 (6 months) .. | 2,400 | 320 1 12 | |
| 1868 (6 months) .. | 4,000 | 284 0 0 | |
| 1869 (9 monhts) .. | 7,000 | 606 7 18 | 260 0 0 |
| 1870 .. .. | 8,800 | 614 10 0 | |
| 1871-1881 .. .. | 7,421 | 448 12 18 | |
| 1882 (9 months) .. | 743 | 144 7 1 | 208 6 0 (Final.) |

In 1880 a new company took possession of the ground, and installed a plant to test at a depth the formation worked at shallow levels by former companies.

### PARADE COMPANY.

The Parade Company was formed in 1872 to work an area on Dyte's-parade, near the Ballarat-Melbourne railway line, and adjacent to the Grand Duke and the Duchess Companies. Quartz veins in the neighbourhood of the Indicator attracted most attention, and these yielded well. During 1873 and 1874 an abundance of quartz yielded from 10 dwt. to 12 dwt. of gold per ton. In 1876 a "specimen" containing 197 oz. 7 dwt. of gold was found. In 1877 the chief operations were at No. 2 shaft, 434 feet deep, especially between the 320-ft. and 384-ft. levels on veins which dipped to the north, and proved to be very rich where they intersected the Indicator. In 1878 a drive south at the 434-ft. level on the Indicator yielded rich specimens. By the end of the year No. 2 shaft was 489 ft. deep, and a level at this depth connected to a winze below the 434-ft. level, which had passed through two gold-bearing veins. A specimen weighing 36 oz. was obtained from the bottom of this winze. The Royal Harry shaft was worked on tribute, and reached a depth of 200 feet in 1879. In 1880 the deeper levels in No. 2 shaft were flooded, and additional machinery was installed. No. 1 shaft was let on tribute. In 1887 a cross-cut 185 feet long was put in east from No. 2 shaft at the 434-ft. level, but it failed to locate anything of value. At the 550-ft. level, in 1881 and 1882, a cross-cut west to intersect the runs of stone being worked by the Queen and Black Hill Companies, and another east to the east Mundic Slates, proved nothing of value, and the mine was then let on tribute. In 1883 water from the Victoria mine on the south flooded the bottom levels. Operations were continued to 1886, when the company was wound up. The following yields were recorded:—

| Year. | Ore crushed. | Gold Won. | |
|---|---|---|---|
| | Tons. | Oz. | dwt. |
| 1873 .. .. .. | 1,448 | 730 | 6 |
| 1874 .. .. .. | 3,132 | 1,826 | 15 |
| 1875 .. .. .. | 2,219 | 1,370 | 9 |
| 1876 .. .. .. | 3,400 | 1,894 | 8 |
| 1877 .. .. .. | 6,947 | 5,335 | 2 |
| 1878 .. .. .. | 4,220 | 2,796 | 3 |
| 1879 .. .. .. | 533 | 289 | 1 |
| 1880 .. .. .. | 476 | 366 | 3 |
| 1881 .. .. .. | 1,330 | 527 | 18 |
| 1882 .. .. .. | 1,307 | 386 | 12 |
| 1883 .. .. .. | 229 | 121 | 10 |
| 1884 .. .. .. | 240 | 218 | 11 |
| 1885 .. .. .. | 898 | 464 | 7 |
| 1886 .. .. .. | 788 | 178 | 10 |

### PERSEVERANCE AND REFORM COMPANIES.

On the Black Hill Flat, during 1859, a number of "old ground" sluicing and puddling claims were at work. Two of these, the Reform and the Perseverance companies, while working the alluvial, met with gold-bearing quartz veins, and sank shafts to a depth of 100 feet during 1860. The Reform Company found only small veins, and soon closed down, but the Perseverance Company, at 40 feet from the surface, worked a reef from 2 ft. to 4 ft. wide, which showed good prospects of gold. At the lower levels the quartz was not so good. Early in 1861 a battery of 12 heads was installed at a cost of £1,750. A trial crushing of 40 tons yielded between 5 dwt. and 6 dwt. to the ton. By July, 1861, the battery was in working order. The first clean up returned 77 oz. for 14 days' crushing, and enabled a dividend of £15 per share to be declared. Crushing with variable success was continued throughout 1861.

### PERSEVERANCE (NEW PERSEVERANCE) COMPANY.

The Perseverance Company, White Horse Ranges, was formed in May, 1860, and 5,000 shares of £4 each were issued. Shortly afterwards the title was altered to the New Perseverance Company. The claim, which measured over 2,000 feet along the line of lode, was situated near the head of the White Horse lead. Prior to the formation of the company, a co-operative party had worked the ground for two years, and had crushed 4,650 tons of stone, which yielded £7,250 worth of gold, an average of £1 11s. 3d., or nearly 8 dwt. to the ton. The lode averaged 11 ft. wide, and at the 150-ft. level it was 25 ft. wide. From this level some rich stone was obtained in April, 1860, and also a patch of nearly 6 lb. weight of pure gold[1]. From the time that the company took up the ground the yields were small. A battery of 24 heads of revolving stamps was installed in 1861. By July, 1862, the company found that the formation was not a defined lode, but a series of spurs with an easterly underlie and a northerly pitch. The slate and country rock separating the spurs were more or less mineralized, and a foot of this encasing material was crushed with the quartz. The spurs were mined by an open cut 40 feet deep, 200 feet long, and 100 feet wide. The surface rubble on the

[1] *Ballarat Star*, 25th April, 1860.

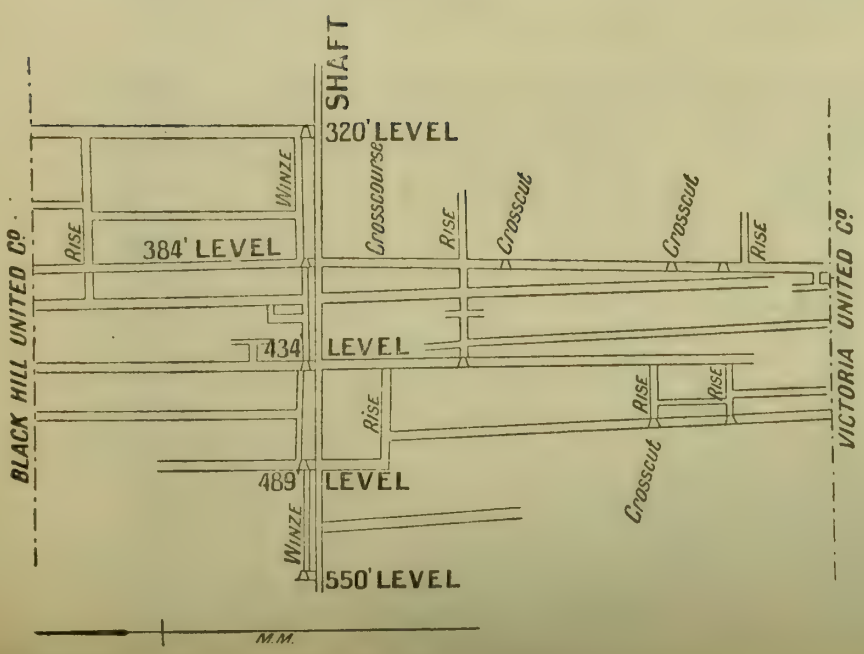
# PARADE MINE
## BALLARAT EAST

Scale of Feet

0 10 20 30 40 80 120 160

*Geological Survey Office, Ballarat,*

*Copy of Mine Plan after late John Watson 1890.*



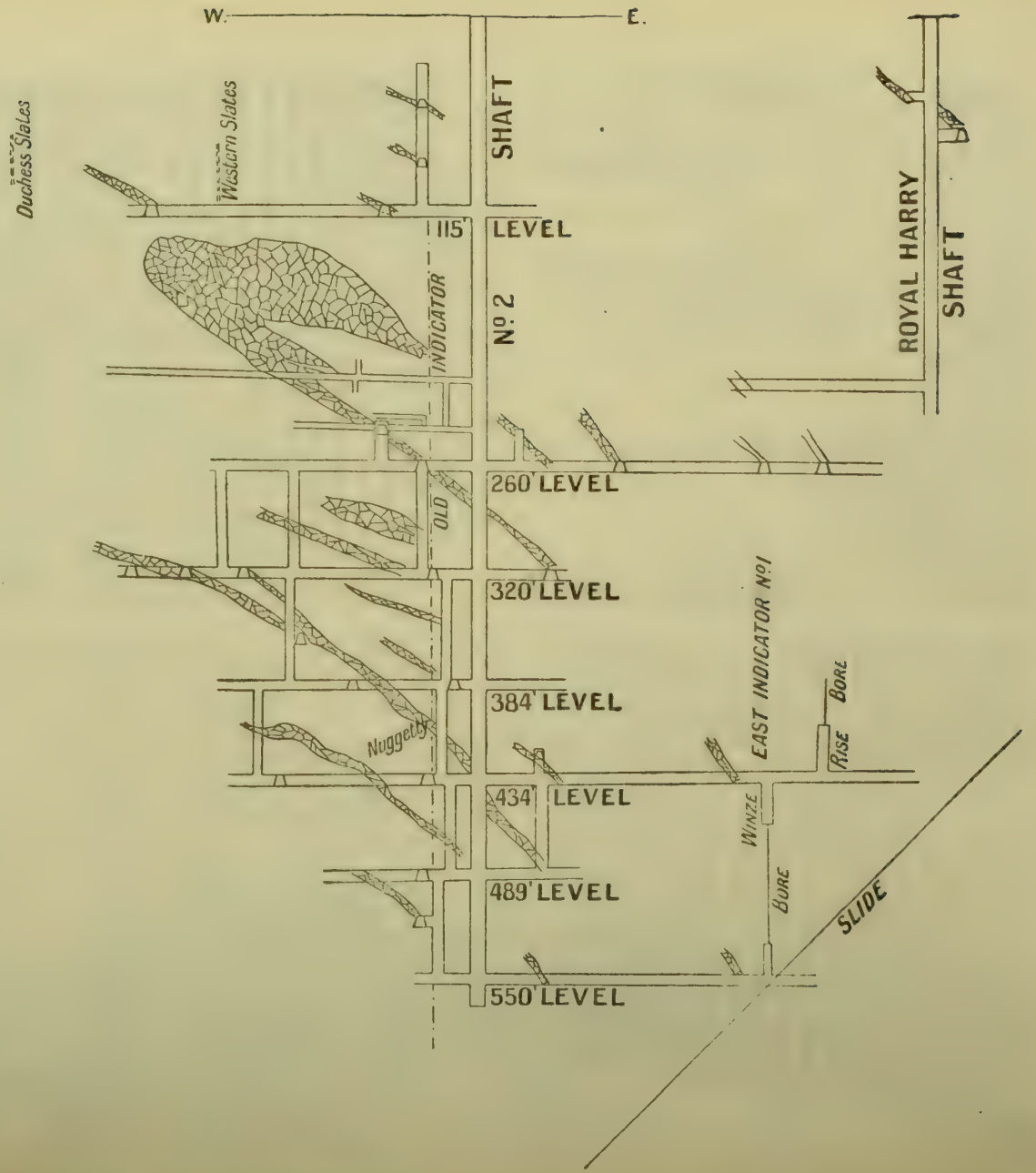




Fig. 27. Longitudinal and Transverse Section, Parade Mine, Ballarat East.

hillside was found to be payably auriferous, and was passed through the battery. At this date (July, 1862) the yield was 1 dwt. 16 gr. to the ton, and crushings of 900 tons a fortnight left a profit over working and other costs. In September, 1862, the mine was let on tribute for a period of six months. The gold yield to August, 1862 (1,361 oz.) was sold for £5,475 12s. 10d. The only available return from the tribute party was 39 oz. 10 dwt. for the first 9½ days, 240 trucks per day being treated.

PRINCE OF WALES COMPANY, SEBASTOPOL.

This company was formed during 1891. The shaft reached bedrock at a depth of 163 feet, and the mine was then equipped with machinery. At 190 feet from the surface a level was opened to test the Lord Raglan gutter. In 1894 a plat was cut at a depth of 400 feet. Shaft sinking was continued in hard country, and the 500-ft. level was opened before the end of the year. At the 500-ft. level, a cross-cut east passed into softer country at 190 feet. Up to this point very hard country was met with. The level passed through a number of quartz veins varying in thickness and underlying west, and between 200 feet and 350 feet a little gold was found in the veins, but not sufficient to be payable.

During 1896 the 500-ft. level cross-cut was extended 503 feet from the shaft, intersecting a formation 8 ft. wide at 396 feet. A south drive along this formation for a distance of 100 feet proved an unpayable lode to be up to 12 ft. wide. Operations at this depth were suspended in June, 1896.

In 1899 puddling machines were installed, and operations were carried on by tribute parties in the shallow levels, but the value of the wash was not sufficient to satisfy the tributers, who then abandoned the area. In 1900 the plant and machinery were disposed of.

PRINCE OF WALES AND BONSHAW COMPANY.

The Prince of Wales and Bonshaw Company was formed in 1885, the main objective being to work the downward continuation of the quartz reef proved by the Prince of Wales Company (alluvial) in 1861. The main shaft was started over a quarter of a mile south of the old workings of the alluvial mine, and was sunk to a depth of 715 feet before a level was opened out. Operations at the 715-ft. level were continued for some time without success, although a well defined lode-track was followed. Later workings revealed the existence through the mine of two parallel formations about 100 feet apart with payable though short shoots, which were worked to a depth of 1,254 feet. At this level all operations ceased, owing to the small size of the lodes and the hardness of the surrounding country. In 1894 a dividend was paid, but taking into consideration the large area held and the extensive prospecting carried out, the mine was unsuccessful. In 1901 a lengthy cross-cut was put in east to work the continuation of the Guiding Star lode, and a lode-track regarded as this line was followed without success. As the lower levels filled with water, prospecting at still shallower depths was resorted to, and at the last the reef-washes of the alluvial were tested. Operations ceased in 1904.

An account of the various workings obtained from weekly reports is appended:—

*510-ft. Level.*—Prospecting operations at the 510-ft. level were begun in 1897. The east cross-cut was driven in east dipping strata for 100 feet, but the dip then changed. To try and locate the continuation of the Camp lode this cross-cut was extended to 431 feet without success.

During 1900 the east cross-cut was extended to 854 feet, the face being under the eastern edge of the main road from Ballarat to Buninyong. During the first six months of 1902 the cross-cut was extended to 1,632 feet from the shaft, and at 1,515 feet it passed through a lode assumed to be the Guiding Star. Drives were opened out north and south on this lode-formation, which consisted of solid quartz 1 ft. 8 in. wide, underlying west, and well mineralised. In the north drive from 60 feet the reef ranged from 1 ft. 8 in. to 3 ft. wide, and showed a little gold at times. By the end of 1902 this north drive was in a distance of 200 feet; at 140 feet from the cross-cut was a cross-course, and as far as this a fair body of mineralized quartz, with a little gold, was followed, but north of the cross-course no lode was found.

The south drive on this formation for a distance of 90 feet proved a solid reef varying from 1 ft. 8 in. to 4 ft. wide, well mineralised, and carrying a little gold as far as a fault at 90 feet. The drive was continued during 1903 to 639 feet south of the cross-cut, the lode ranging up to 2½ ft. wide, and in places carried a little gold. In 1902 a crushing of 21 tons of ore from this drive yielded 33 oz. 7 dwt. of gold. A rise was put up 22 feet at 390 feet south of the cross-cut, but the quartz did not continue in this direction.

The west cross-cut passed through the Western lode at 226 feet from the shaft, but the lode at this point consisted of only a few inches of mineralized quartz on a good footwall. At 316 feet from the shaft another lode-track carrying a few inches of laminated quartz was intersected. On the west of this track a drive was opened out on slate with quartz veins, but 40 feet of driving failed to meet with any larger formation.

*600-ft. Level.*—The cross-cut at this level was started in 1899, and at 150 feet west of the shaft it passed through a lode-track that proved to be much broken. A drive south along this track was stopped at 60 ft.

*714-ft. Level.*—Cross-cutting west at this depth began in 1899, and before the end of the year the lode-track was intersected at 140 feet from the shaft. Where cut the lode was small, but it improved in the drive north, and at 155 feet it carried highly mineralized quartz showing gold. The greater part of the lode-track for the last 400 feet was broken and disturbed, but at 550 feet from the cross-cut a strong lode carrying galena and black-jack came in, and at 610 feet a little gold made on the western side of the lode. A little further on the lode became disturbed, though gold was visible in the reef at 680 feet from the cross-cut. At 650 feet north of the cross-cut a winze was sunk to a depth of 30 feet, proving the lode to be 5 ft. wide. Owing to the proximity of these workings to the old workings of the Prince of Wales Company, operations at this level were suspended, while shaft-sinking was carried out to a depth of 968 feet.

*954-ft. Level.*—Early in 1891 the 954-ft. level was opened out. At 92 feet west from the shaft the western wall of the lode, here 9 ft. wide, was

met with. A drive was put in north, and at 55 feet from the cross-cut a solid heavily mineralized lode 3 ft. wide was exposed, but further north it became very irregular. A short shoot of gold-bearing ore 120 feet long was intersected within 400 feet of the cross-cut, but the drive was continued to 780 feet without much change. The main cross-cut was extended west, and at 198 feet from the shaft it intersected a well-defined lode (the Western), carrying highly mineralized stone 9 in. wide, on the west wall. In driving south a little gold was seen for 50 feet. To prove the northern continuation of the Western lode, a cross-cut (No. 1) was driven west from the drive that had been put in along the reef at 92 feet east of the shaft. This cross-cut began at a point 590 feet north of the main cross-cut, and extended 193 feet west. At 178 feet a lode with stone 4 ft. wide on the eastern wall was intersected. No. 2 cross-cut at 300 feet north cut the Western lode at 100 feet; the lode at this point was small. The No. 3 cross-cut 590 feet north cut the lode at 85 feet from the main drive; at this point the lode was 1 ft. 6 in. wide, and well mineralized.

The north drive was continued to 1,273 feet from the main cross-cut. At 1,100 feet north were two well-defined walls 5 feet apart, with a make of quartz on the eastern wall, and as far as the face the quartz varied from a few inches to 2 ft. wide, was well mineralized, and in places it carried a little gold.

To prove the formation found at 178 feet in No. 1 cross-cut, No. 4 cross-cut was put in at 1,113 feet north of the main cross-cut, and, at 112 feet west, a lode 22 ft. wide, and carrying gold for its full width, was intersected. Drives were put in north and south on the footwall of the lode, and trial crushings proved the footwall stone to carry over half an ounce of gold to the ton. In the north drive, which extended 127 feet from the cross-cut in 1893, the reef was highly mineralized. Two rises were put up, No. 1, at 30 feet from the cross-cut, carried gold-bearing stone for 55 feet, and poor stone to 111 feet; No. 2 rise, at 120 feet north, was put up 92 feet. South of the cross-cut the lode carried gold for 725 feet, but it then became broken. At 100 feet south a winze was sunk 34 feet in a strong lode, which was gold-bearing on the footwall side. Stoping on the lode was begun on both sides of the cross-cut in 1894, a length of 200 feet being worked up to the 845-ft. level, by 1895. Trial crushings were taken from the Eastern lode in 1895, but they were unpayable.

South of the main cross-cut the Eastern lode was driven on for 237 feet, but proved very small to the face. Towards the end of 1902 the north drive was repaired, and during 1903 a cross-cut west was put in 600 feet from the main cross-cut to intersect the continuation of a shoot then being worked at the 954-ft. level. At 125 feet from the main north drive the cross-cut intersected the Western lode, which consisted of 1 ft. to 1 ft. 6 in. of laminated quartz. A short drive was put in, but the lode proved unpayable.

*845-ft. Level.*—In 1891 the line of lode was cut at 95 feet west of the shaft. A drive was put in north along it, but the track was small for 350 feet. At this point it improved, and at 450 feet a formation from 4 ft. to 5 ft. wide carrying gold came in, and continued to 520 feet. The drive was extended to 660 feet from the cross-cut. The shoot of gold-bearing stone at this level was only 60 feet in length.

To test the Western reef a cross-cut west was put out at 600 feet north of the main cross-cut. This intersected the lode at 93 feet from the main drive, and was continued to 200 feet. Driving north on the course of the western lode was undertaken for 730 feet from the cross-cut. For 600 feet the lode was small, but a shoot of mineralized stone came in, and lasted for 110 feet before becoming disturbed. A rise was put up 54 feet near the north face, and in 1894 a drive along the course of the lode at this level proved a strong body of quartz carrying a little gold for a length of 100 feet.

*954-ft. Level.*—In 1899 the west cross-cut was extended, and at 528 feet from the shaft a change in the dip was noticed, probably an anticline. At 800 feet from the shaft the cross-cut intersected a lode-track with two walls 3 feet apart, underlying west. It carried laminated, highly mineralized quartz, with a little gold. A drive was put in 192 feet north along this lode, named the New Lode, which varied from a few inches to 1 ft. 6 in. wide. A drive was also put in for 54 feet south, but the lode remained small.

During 1902 a fall in the north drive exposed some promising stone, which assayed 18 dwt. of gold to the ton at a point 250 feet north of the cross-cut.

*1,054-ft. Level.*—Cross-cutting west at this level began towards the end of 1894. At 94 feet from the shaft the Eastern lode, here much disturbed, was intersected. The Western lode was cut at 209 feet, and carried mineralized stone from 6 in. to 8 in. wide on the wall. A drive was opened north on a few inches of quartz carrying a little gold. The stone continued small for 800 feet from the cross-cut, where a large body of well-mineralized quartz carrying gold was cut. A rise was put through to the 954-ft. level, and stoping was carried out on a fair body of payable quartz. These stopes in 1897 proved that the rich run of gold-bearing stone worked at 954-ft. level did not continue below that level.

*1,154-ft. Level.*—This level was opened in 1894. At 119 feet the cross-cut west cut the Eastern lode, which carried 1 ft. 6 in. of gold-bearing ore on the wall. The Western lode was cut at 215 feet from the shaft; it had a well-defined footwall carrying veins of mineralized quartz.

For a distance of 90 feet the quartz from the north drive on the Eastern lode averaged 8 dwt. of gold to the ton, but further crushings were unpayable. A trial crushing of 15 tons taken from a south drive, 30 feet in length, yielded 4 dwt. of gold to the ton. The lode was found to be very irregular.

The main north drive was put in along the Western lode, and by 1896 it was 1,000 feet in length, the quartz on the footwall side varied from a few inches up to 4 ft. wide. Beyond 900 feet the lode was much broken, and its dip became easterly instead of westerly. At 300 feet north of the main cross-cut the drive passed through 30 feet of good ore on which stoping began in 1895. At 500 feet north of the cross-cut a rise was put up and 400 feet of narrow but highly mineralized lode was stoped out on both sides of the rise.

At 900 feet north of the main cross-cut, a cross-cut was put in east to test the Eastern lode, which was cut at 118 feet from the main drive. It had two well-defined walls about 17 feet apart, with quartz 6 in. wide on the footwall underlying west. This cut out in the drives north and south.

In 1896 a south drive on the Western lode was opened from the main cross-cut. A well-defined footwall carrying a few inches of well-mineralized quartz and dipping west was followed for 370 feet, but the lode continued small. It was in hard country.

*1,254-ft. Level.*—Towards the end of 1896 this level was opened. At 236 feet from the shaft it intersected the Western lode, which had a well-defined footwall with laminated quartz 2 ft. wide in pug against the wall. A north drive on the lode proved well-mineralized quartz from a few inches to 2 ft. wide, which occasionally carried a little gold, but at 365 feet from the cross-cut a large body of quartz was discovered; it was from 6 ft. to 10 ft. wide, carried galena, blackjack, and a little gold, and continued for 190 feet. At 560 feet from the cross-cut solid quartz 3 ft. wide occurred, underlying west and carrying galena, blackjack, and gold. To 750 feet the lode varied from 6 in. to 6 ft. wide, was well mineralized, and showed gold. At 750 feet the lode was 6 ft. wide, and yielded 11 dwt. of gold to the ton without pyrites, but at 790 feet it was disturbed by a fault which dipped in a south-westerly direction. A stope was commenced on the northern shoot, which lay further north than those worked in the level above on account of the southerly pitch. At 1,100 feet north there was disturbed country which continued to 1,360 feet from the main cross-cut, and then laminated quartz a few inches wide and underlying west was exposed. At 1,400 feet from the main cross-cut there was a cross-course.

At 1,323 feet north of the main cross-cut, an eastern cross-cut was put in from the north drive for 275 feet. At 74 feet from the main drive, after this cross-cut passed through 60 feet of slate with mineralized veins dipping east and carrying gold in some places, it intersected a well-defined lode underlying west. The drive was in lode material for its full width for 140 feet, and then it rose over the back of the drive. At 206 feet from the east cross-cut the cross-course proved in the main drive was found. At this point the drive turned north-easterly and passed through strata intermixed with east-dipping quartz veins. At 113 feet north of the east cross-cut a rise was put up 104 feet on the footwall of the large body of quartz which had been passed through in the main drive. At 15 feet up quartz showing good gold was found; this continued for 30 feet, but it then became broken and small and continued so to the top of the rise, where a drive was put in north to intersect the run of gold-bearing stone. A drive south was also started from the top of the rise to connect with the main north drive at the 1,154-ft. level. The face of the drive was 420 feet south of the rise by July, 1900. Stoping was started over the 1,254-ft. level north of the rise to meet the better ore, and so worked to better advantage. At 464 feet north of the main cross-cut a rise was put up to the 1,154-ft. level on mineralized stone 2 ft. wide. At 45 feet in this rise an intermediate level was opened out 145 feet in a lode up to 4 ft. wide, highly mineralized, and carrying a little gold. An intermediate level south passed through the shoot of stone at 170 feet, and in 1898 a lode averaging 2 ft. wide but not very rich was stoped above this intermediate level. At 390 feet north of the main cross-cut a cross-cut east at 126 feet from the drive intersected the Eastern lode, which carried laminated quartz 8 in. wide on the footwall at this point.

The south drive from the main cross-cut on the Eastern lode carried quartz from 9 in. to 1 ft. 6 in. wide on the footwall; a crushing of this yielded 7 dwt. to the ton, but as it was in hard country at 100 feet from the cross-cut it was barely payable.

South from the main cross-cut a drive was put in on the Western lode, which consisted of a few inches of highly-mineralized stone on a defined footwall, which continued without change for 613 feet.

During 1900 the north drive on the track of the Western lode was continued to 1,700 feet from the cross-cut, the country north of the cross-course being much disturbed.

At 1,425 feet north of the cross-cut a rise was put up 104 feet in a large body of quartz, and at this height a drive was put in northerly 180 feet on the full face of quartz, which showed at times a little gold; a drive south at this level for a length of 125 feet proved a large poor lode. The main level passed through disturbed country to 1,698 feet.

At 1,323 feet north of the cross-cut, a cross-cut was driven 110 feet west during 1902, but only a few small veins were found. All work at this level then ceased, and subsequent operations were confined to prospecting shallow levels.

*303-ft. Level.*—Towards the end of 1903, after the lower levels had been abandoned, a cross-cut was opened out at 300 feet from the surface and driven west 303 feet. At 156 feet it passed through mineralized slate dipping east; at 200 feet it intersected the Middle lode, which carried mineralized quartz 6 in. to 8 in. wide, and at 301 feet the West lode with 6 in. of quartz. Drives on the Middle lode were put in north 209 feet and south 519 feet. The lode varied in width up to 4 ft., and was well mineralized, but carried little gold.

*198-ft. Level.*—Towards the end of 1903 a cross-cut was opened at a depth of 198 feet, and during 1904 it reached a total length of 528 feet. At 200 feet from the shaft it passed through quartz veins, and at 313 feet it intersected the West lode, which carried a few inches of quartz. Several bores were put up above this level to prospect for reef-wash, but no gold was obtained.

The following is a record of the yields:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons. | oz. | dwt. | gr. |
| 1891 .. .. | 2 | 2 | 10 | 15 |
| 1892 .. .. | 47 | 9 | 5 | 0 |
| 1893 .. .. | 166 | 450 | 19 | 0 |
| 1894 .. .. | 8,780 | 5,135 | 4 | 6 |
| 1895 .. .. | 2,616 | 1,924 | 17 | 12 |
| 1896 .. .. | 4,553 | 1,877 | 14 | 20 |
| 1897 .. .. | 1,623 | 472 | 3 | 0 |
| 1898 .. .. | 2,638 | 591 | 16 | 0 |
| 1899 .. .. | 83 | 20 | 13 | 0 |
| 1900 .. .. | 568 | 587 | 3 | 0 |
| 1901 .. .. | 2,096 | 1,088 | 0 | 0 |
| 1902 .. .. | 230 | 69 | 17 | 0 |
| 1903 .. .. | 255 | 67 | 6 | 0 |
| 1904 .. .. | .. | .. | | |
| 1905 .. .. | .. | .. | | |

For the period 1891-1903, the total output was 14,783 oz. 11 dwt. of gold from 29,880 tons of ore, and dividends amounted to £2,347 10s.

PRINCE REGENT COMPANY.

The Prince Regent Company was formed during the revival consequent on the developments by Pearce Bros. at Canadian Gully, and the unwatering of an abandoned area.

This mine is interesting chiefly because it is adjacent to a cross-course that is reputed to displace the Indicator 612 feet. North of this cross-course the Indicator belt has been worked continuously as far as Black Hill. The strata to the west of the Indicator in this and in the adjacent mines to the north (see North Woah Hawp) have yielded large quantities of payable ore, and are known as the Western, Clarke's, the 4-ft., the 7-ft., and the 12-ft. Slates, and the Big Sandstone country. They have not been exploited to the south of the big cross-course.

On the flotation of the company, shaft-sinking was begun on the surface outcrop of the Indicator, and in 1887 the shaft had reached a depth of 560 feet, passing through several veins at a depth of about 500 feet. Work was carried out on the Western Slate or Clarke's Reef, where flat makes of variable quality were exposed at the 240-ft. level; on the Indicator at the 300-ft. level, where good stone was worked to the south; and at the 420-ft. level, where a drive south proved the southerly pitch of the leatherjacket.

In 1888 the shaft was continued to 720 feet from the surface. It passed through numerous quartz veins, which were tried but found to be unpayable. Prospecting and development were in progress at the 330-ft., 420-ft. and 554-ft. levels.

In 1889 prospecting at the 280-ft. level was suspended, while the 554-ft. level was continued through the large cross-course. At the 420-ft. level large bodies of quartz were stoped near the Indicator, and a large body of ore was located to the west on Clarke's line.

In 1890 the 500-ft. level was opened to intersect the quartz proved in and below the 420-ft. level; the cross-cut west at this depth was extended to Clarke's line. A large quantity of payable quartz from above the 500-ft. level was treated.

In 1891 the Western or Clarke's lode was cut at the 500-ft. level at 400 feet west of the shaft, but it was poor. The shaft was then unwatered to 580 feet, where a level was opened west, but the cross-cut did not reach the line of Clarke's lode before the end of the year.

In 1892 stoping was continued at the 570-ft. level on quartz of varying size and value. The 630-ft. level passed through gold-bearing quartz at 200 feet west of the shaft and through another formation 57 feet further west. The 700-ft. level was opened, and a cross-cut west at this depth cut the Indicator at 45 feet from the shaft, but the stone on it was poor.

In 1893 little work was done at the lower levels, and the stone treated was poor.

In 1894 shaft-sinking was resumed to a depth of 878 feet. At 864 feet the shaft passed through a formation, and the 870-ft. level was opened to cut the stone on the Indicator. Payable quartz was worked at the 770-ft. level on Clarke's line.

In 1895 prospecting at the 870-ft. level failed to open up payable stone, but the 770-ft. level continued to be payable, and tributers worked in various parts of the mine with profitable results.

In 1896 the principal workings were at the 700-ft. level. An east cross-cut at the 870-ft. level was driven 100 feet and then stopped, and a drive on the Western Slates, at 250 feet from the shaft, was carried on for a time, but the country proved to be broken. Some rich patches were located at the 700-ft. level Shaft-sinking was resumed, and the 970-ft. level was opened before the end of the year.

In 1897 a cross-cut west at the 970-ft. level was continued to the 4-ft. Slate, where a drive south was put in 137 feet on a large body of quartz, which looked promising but proved to be poor. A rise was put up to the 870-ft. level on a formation on the Large Slate, but this also proved to be poor. Work at the 870-ft. level was confined to poor stone on the Large and 4-ft. Slate. The quartz crushed during the year yielded about 3 dwt. of gold per ton.

In 1898 no success attended prospecting at the 970-ft. level, and sinking was resumed. At 1,020 feet the shaft passed through two flat bodies of gold-bearing quartz, and the 1,070-ft. level was opened, where a cross-cut west was put in for 305 feet. At 290 feet this level passed through leaders which extended for 15 feet and carried a little gold. At the 870-ft. level large bodies of low-grade quartz were mined on the Large Slate. The drive on the 4-ft. Slate was extended to 270 feet south, the most southerly point at which gold-bearing quartz was located.

In 1899 the shaft reached 1,228 feet, the greatest depth then attained in Ballarat East, and the 1,220-ft. level was opened west by the end of the year. At the 1,070-ft. level nothing payable was located in 100 feet of driving south.

In 1900 the west cross-cut at the 1,220-ft. level passed through three vertical bodies of quartz at 74 feet from the shaft; at 290 feet west it passed through the Large Slate, east of which was a lode formation; a drive south on this formation produced quartz yielding 4 dwt. of gold per ton for a distance of 30 feet, where a cross-course reduced the size and value of the stone. The cross-cut was continued to 415 feet, and a rise on the Large Slate to a height of 58 feet passed through leaders only. In August the level was abandoned. While the water was rising in the shaft, the Large Slate was prospected in the 320-ft. level, and the Western Indicator in the 420-ft. level for a few weeks, but in September all work ceased.

DETAILS OF LEVELS.

*240-ft. Level.*—During 1887 the Western Slates or Clarke's reef occupied most attention. It consisted of flat makes of quartz branching off from the main vertical reef, and it improved to the south, where it pitched underfoot. Work was then abandoned until a deeper level was opened out. The west cross-cut was extended to 460 feet west of the shaft, and the east cross-cut was put in 150 feet. At this level the Indicator was situated 5 feet to the east of the shaft.

*330-ft. Level.*—In 1887 work at this level consisted in driving southwards on the Indicator, where ore of fair value was taken out.

During 1888 and part of 1889 operations were confined to extending the west prospecting cross-cut to a distance of 406 feet from the Indicator, and to putting up a rise for 25 feet on a small vertical vein which opened out to 2 ft. wide, and showed gold freely at 8 feet up the rise.

In 1890 the west cross-cut, at a distance of 450 feet from the shaft, intersected Clarke's lode, which showed gold, and gave out a strong flow of water. A rise from this level cut a promising-looking ore body 5 ft. wide, showing gold.

*420-ft. Level.*—During 1887 work at the 420-ft. level was carried on south along the Indicator. The drive at this level was extended to 502 feet from the shaft, and to 215 feet from the last cross-course.

In 1888 good payable ore was worked, but was exhausted towards the end of the year.

In 1889 a trial crushing from two flat veins at 50 feet from the shaft proved unpayable. The main cross-cut was extended another 100 feet west, and at 126 feet from the shaft it intersected a vein about 9 in. wide, which carried fair gold. A drive south for a distance of 45 feet showed that this formation was payable. The cross-cut was then continued, and a large body of quartz 2 ft. to 5 ft. wide was found; a trial crushing of 40 tons yielding over 8 dwt. of gold to the ton.

During 1890 a large body of quartz in the level was profitably worked. A contract was let to cross-cut at the 450-ft. level to intersect the quartz; this was found at a distance of 128 feet from the shaft, showing gold freely and giving out a strong flow of water. A drive of 130 feet south on this formation exposed payable quartz 2 ft. to 3 ft. wide. Stoping was carried on between these two levels in large faces of payable stone. The west cross-cut was extended to 339 feet from the shaft, where a small vein was exposed in the face.

*500-ft. Level.*—This level was opened in 1890, and a cross-cut west was extended 382 feet to intersect the stone worked in the levels above. This was found at 85 feet, where it was 3 ft. wide, well mineralized and carrying a little gold. At 27 feet the cross-cut intersected a rich vein along which drives were opened north and south.

In 1891 the main west cross-cut was extended to 400 feet from the shaft where the Western lode was found, but it was poor. In a drive of 80 feet south, the lode widened out, and gold was seen in breaking out the quartz, and a crushing of 80 tons yielded 60 oz. 10 dwt. A rise of 40 feet in the Large Slate exposed a good body of ore, which was poor at first, but improved in a south drive.

In 1896 the south drive on the Western lode was extended 190 feet, and continued on the ore body, in which rich patches had previously been worked.

*550-ft. Level.*—In 1888 a level was opened south on the Indicator along a vein of good quartz until it split and became poor. West of the Indicator some payable quartz was stoped, but most of these veins were poor. On the Western Slates at 19 feet from the Indicator a vein of quartz was worked for a time, but the level was abandoned during the year.

*570-ft. Level.*—During 1892 the 570-ft. level was opened out west of the shaft, and a cross-cut was extended to 394 feet. Driving and stoping south were carried out along the Western lode for a distance of 250 feet. At 200 feet from the shaft a rise was begun, and at a height of 12 feet poor quartz was intersected. This, however, was found to improve in a drive to the eastern wall. The rise was continued to a height of 40 feet, where another make of stone was cut. A trial crushing of 50 tons from these two veins gave a return of over 5 dwt. of gold to the ton.

*620-ft. Level.*—During 1892 the 620-ft level was opened, and a cross-cut was put out 125 feet west.

In 1893 the west cross-cut was extended to 318 feet from the shaft. At 200 feet quartz was found on which a rise was put up to the 570 ft. level in quartz all the way. At 20 feet in the rise gold was seen. The formation was also opened out by drives north and south, that south of 100 feet being in payable stone. At 275 feet from the shaft another reef was cut on which drives north and south were opened out. The south drive was 40 feet long, and the formation was stoped above it.

In 1894 the drive south on the Western reef was continued, and the quartz improved both in size and quality. The Indicator drive to the south was extended to 175 feet, but owing to the vein pitching out of the level work was stopped here. In 1895 much work was carried out at this level, and fair returns were won.

*700-ft. Level.*—A plat was opened out at the 700-ft. level during the year 1892, and a cross-cut west intersected the Indicator at 50 feet. A rise of 50 feet was put up to cut the lode worked by the Tinworth Company adjoining.

During 1896 much driving and stoping were carried out, chiefly south of the cross-cut, on ore which varied in quality and size. The south drive on the Western Slates was extended to 252 feet on a fair-sized body of quartz.

*770-ft. Level.*—During 1895 much driving and stoping all on payable ore were carried out at this level. In 1896 driving north and stoping west on the Western Slates were in progress, the stone becoming wider in the faces. All the payable stone at this level, as far as the north boundary, was exhausted in 1897.

*870-ft. Level.*—During 1895 the cross-cut west at this level was extended to 292 feet from the shaft. At 247 feet quartz 4 ft. wide was found, and opened out to the south for a distance of 16 feet. At this point a rise was put up on quartz making bigger, and showing a little gold. A good deal of prospecting was undertaken at this level during the year, but without payable results. In 1896 the Large Slate at 250 feet west of the shaft was prospected, but a slide disturbed the country, and work ceased. In 1897 driving north and south, stoping west, and prospecting, were carried on, but the formation was much broken by slides.

In 1898 most of the ore mined on the Large Slate was poor, but driving and stoping south on the 4-ft. Slate proved payable stone to a distance of 270 feet, the most southerly point at which payable ore had been found up to that time on the Western Slates. This discovery indicated that the auriferous shoot trended more southerly as the depth increased.

In 1899 much driving and stoping were in progress south on the 4-ft. Slate, and also west of the formation, but the quartz was poor and small.

*970-ft. Level.*—In 1897 an opening was made at the 970-ft. level, and a west cross-cut was put out 40 feet, passing through two small vertical formations, one on Dunk's Slate, and the other on a small slate 15 feet west of the shaft. The face of the cross-cut showed floors from which a little water was making. A drive south on the 4-ft. Slate was put in 25 feet.

During 1898 the south drive on the 4-ft. Slate was extended through very hard country to 112 feet, and three rises of 35 feet each were put up in a large body of quartz, which was of promising appearance, but of no value. A drive on the Large Slate was opened 37 feet south, and at this point a rise was started. At 34 feet up it intersected poor quartz, which was followed to the level above. Much dead work (drives

west, cross-cuts and rises) was carried out during the year before operations were suspended and shaft sinking was resumed.

*1,070-ft. Level.*—During 1899 a plat was opened at the 1,070-ft. level, and a cross-cut was put out 305 feet west in promising country. At 290 feet from the shaft a leader, carrying a little gold and giving out a strong flow of water, was met with, and from this point to the face leaders occurred, all carrying gold and giving out water. A vein in the face 8 in. wide gave fair dish prospects. A rise at 290 feet intersected quartz giving out much water, at 6 feet above the level.

In 1900 a drive 97 feet south was opened, but it disclosed nothing payable. The shaft was sunk another 103 feet, making the total depth 1,228 feet from the surface. At 1,165 feet the country changed, and at the 1,220 ft. level a plat was cut, and a cross-cut opened for 74 feet west.

*1,220-feet Level.*—The cross-cut west at this level was put in 415 feet, and passed through the Indicator, the Large Slate and the 4-ft. Slate. East of the Large Slate a drive was put in south along a vein that yielded 4 dwt. of gold to the ton for a length of 30 feet. A rise of 58 feet was put up in the Large Slate, but no further prospecting was done, and the level was abandoned in 1900.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons. | oz. | dwt. | gr. |
| 1884 (1 quarter) | 260 | 120 | 0 | 0 |
| 1885 (1 quarter) | 24 | 24 | 0 | 0 |
| 1886 .. .. | 927 | 858 | 17 | 0 |
| 1887 .. .. | 1,830 | 1,104 | 1 | 22 |
| 1888 .. .. | 923 | 983 | 4 | 3 |
| 1889 (3 quarters) | 5,941 | 1,617 | 14 | 12 |
| 1890 .. .. | 12,830 | 2,603 | 16 | 12 |
| 1891 .. .. | 4,467 | 885 | 16 | 12 |
| 1892 (1 quarter) | 551 | 149 | 4 | 0 |
| 1893 .. .. | .. | .. | | |
| 1894 .. .. | 2,238 | 706 | 8 | 6 |
| 1895 .. .. | .. | .. | | |
| 1896 .. .. | 2,707 | 856 | 7 | 0 |
| 1897 .. .. | 6,150 | 1,214 | 7 | 0 |
| 1898 .. .. | 3,291 | 302 | 4 | 0 |
| 1899 (1 quarter) | 125 | 9 | 1 | 0 |

Between 1884 and 1899 82,500 tons of ore yielded 16,500 oz. of gold, and dividends amounted to £8,000.

### QUEEN COMPANY.

The Queen Company, a tribute of the Black Hill Company, on the Black Hill Flat, was formed in May, 1879. It secured the No. 1 shaft of the Black Hill Company (see p. 127) and by the close of 1879, operations were in progress at the 500-ft. and 600-ft. levels. The shaft was sunk to a depth of 712 feet by the end of 1882, and work was carried on until August, 1883. The mine then became the property of the Black Hill Company.

Several large nuggets were taken from this claim on the Indicator and neighbouring slates. The largest weighed 225 oz. It was found in a quartz vein 2 ft. wide, in a rise put up 20 feet above the 500-ft. level at 287 feet north of the cross-cut. From the same tribute block (Brain's) several nuggets were taken from a drive south on the indicator known as the Mundic Grit.

The 500-ft. level south was connected to the United Black Hill Company's workings for ventilation. A main cross-cut put in west for a total of 433 feet passed through several unpayable veins. The yields for the last half of 1880 were good, 3,524 oz. from 5,263 tons, but they fell away to 1,995 oz. from 5,076 tons for the first half of 1881. Towards the end of 1881 some rich quartz found at the 400-ft. level yielded in four days 76½ oz. of gold in nuggets. This yield included nuggets weighing 19 oz. 15 dwt., 16 oz., and 15 oz. 10 dwt., besides smaller pieces. At the 660-ft. level a cross-cut was put in west to the Western Slates. A cross-course that was passed through in following the veins northwards had an upthrow on the north side. This discovery led to the opinion that the principal vein worked by the Queen Company at the 500-ft. level was identical with the payable vein worked north of the cross-course by the North Queen Company.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | Tons. | oz. | dwt. | gr. |
| 1879 .. .. | 5,187 | 2,093 | 2 | 0 |
| 1880 (half-year) | 4,024 | 2,302 | 5 | 23 |
| 1881 (half-year) | 5,263 | 3,524 | 14 | 4 |

In 1883 the claim was taken possession of by the Black Hill Company.

### QUEEN NO. 2 COMPANY.

This company was formed in the boom of 1880-1881. Operations began with the cleaning out of an old shaft on Black Hill Flat. At the 380-ft. level cross-cuts were put in 220 feet east and 200 feet west. At the 280 ft. level the Western lode was cut at 214 feet west of the shaft, and a level was driven 227 feet south along it to test the western part, the eastern part being too poor to be worth a trial. At 116 feet from the shaft a rise connected with a winze sunk from a drive from the old No. 1 shaft in the Black Hill cutting, and this helped to correlate the various strata. At 24 feet from the shaft there was a "vertical," which corresponded to the big vertical west of the Queen Grit in the Queen Company's mine.

The only yield recorded is 19 oz. 6 dwt. from 60 tons in 1881.

### QUEEN NORTH COMPANY.

This company was formed in 1880 to work a portion of the Black Hill Company's ground on Black Hill Flat. An old shaft was cleaned out to a depth of 220 feet, and at 210 feet drives west for 310 feet and north for 250 feet were disclosed. On extending the western drive a body of poor quartz with much water in it was struck at 390 feet. During 1881 shaft-sinking began, and attained a depth of 530 feet by the end of the year. Above the 210-ft. level bores were put to a height of 50 feet on the Indicator, Eastern and Queen Slates, but no quartz was met with. In 1882 payable quartz was found on the Queen Slates at the 427-ft. level. This quartz opened up well throughout the year, 3,599 tons yielding 1,774 oz. In 1883 payable quartz 4 in. to 12 in. wide was located at the 337-ft. level in pyritic slate, and a rise struck a vein at 30 feet carrying ½ oz. of gold to the ton. By July, 1883, the quartz at the 427-ft. level was exhausted, and a drive was put in north for 400 feet. A rise of

50 feet from this level failed to locate anything payable. At the 517-ft. level a drive on a pyritic slate was continued to 200 feet, and several bores were put up without proving payable stone.

### QUEEN VICTORIA COMPANY.

The Queen Victoria Company, Canadian Gully, was formed early in 1868, and was fortunate in discovering very rich specimens in March of that year. A trial crushing of 63 tons taken from a reef 14 ft. wide yielded 25 oz. 5 dwt. of gold. After paying the cost of cartage and crushing, 10s. a ton, this left a good margin of profit. A second trial of quartz obtained in eight days during April, 1868, yielded 52 oz. of gold. By July the main shaft had been sunk to a depth of 105 feet, and a cross-cut had been driven east. At 75 feet a lode 13 ft. wide was cut, and at 132 feet another formation 12 ft. wide. West of the shaft two small veins were found. A battery was erected, and crushing commenced. The mine provided a flutter in the value of shares during the latter part of 1868. Owing to a bad crushing shares fell to 5s., but in a few days rich quartz was struck, and they rose to £5 5s. The stone, though rich, was not as rich as expected, and shares again fell to £1 7s., recovering to £1 15s.

In 1869 the company purchased a piece of land adjoining the claim in Prince Regent Gully, and sank the main shaft to 265 feet. The profits for the quarter ending July, 1869, were £849 3s. The results at the deeper levels did not prove as satisfactory as those from the 160-ft. level and above, and the deeper levels were not worked during 1869, 1870, and 1871. In 1870 the quartz crushed came from the 160-ft. and 130-ft. levels and levels above, and averaged about 5 dwt. of gold to the ton. At the 160-ft. level the reef was stoped for a width of 12 ft., and between the 130-ft. and 100-ft. levels for a width of 28 ft. Above the 100-ft. level the stopes were from 30 ft. to 50 ft. wide on a formation consisting of spurs and veins throughout the strata, with no defined walls.

In 1871 a cross-cut east of the main lode at the 130-ft. level cut the Black lode at a distance of 157 feet. This lode was 2 ft. wide where cut and widened out northwards. Work at the 210-ft. level was resumed in August, 1871, and a drive was put in northerly, the main workings lying in that direction from the shaft. In 1873 the whole formation, 35 ft. to 50 ft. wide, between the 160-ft. and 210-ft. levels, was taken out and crushed. A prospecting cross-cut at the 210-ft. level intersected the Western lode, which was 2 ft. 6 in. wide at 350 feet west of the shaft. No. 2 shaft was sunk to a depth of 270 feet by September, 1873, but heavy water and lack of funds stopped further work. In 1874 prospecting to the south of No. 1 shaft at the 210-ft. and 260-ft. levels yielded encouraging results. The 260-ft. level south drive was connected with the No. 2 shaft, a distance of 1,220 feet being driven along the course of the lode. In 1872 the maximum tonnage was treated, and afterwards the available ore dwindled until all of it that was payable became exhausted in 1874, and operations came to an end. The ground was afterwards secured by Manners (see p. 234).

The following yields were obtained:—

| Year | Ore Crushed. | Gold Yield. |
|---|---|---|
| | Tons. | oz. dwt. gr. |
| 1868 .. .. | 800 (approx.) | 200 0 0 (approx.) |
| 1869 .. .. | 3,224 | 640 7 16 |
| 1870 .. .. | 9,134 | 1,875 8 22 |
| 1871 .. .. | 13,990 | 2,013 1 0 |
| 1872 .. .. | 20,564 | 2,773 9 0 |
| 1873 .. .. | 19,581 | 1,612 10 10 |
| 1874 .. .. | 3,592 | 721 12 3 |

The average yield from the whole tonnage was 2 dwt. 17 gr.

### REDAN AND ADJACENT GROUP OF MINES.

The successful opening up of the reef in the No. 6 shaft of the Band of Hope and Albion Consols, together with the results obtained by the New Kohinoor towards the end of the 'seventies, led to the flotation of a large number of mines for the purpose of locating the continuation of the formations which were proving so remunerative at the above-mentioned mines. Early in 1880 the following companies were in existence. Some were at work; others were shepherding, and never started mining:—

Ballarat Quartz.
Band of Hope and Albion Consols.
North Band and Albion Consols.
North Band and Albion.
North Band and Albion Freehold.
South Band and Albion.
Young Band and Albion.
Young Band Extended.
No. 2 Band of Hope.
No. 3 Band of Hope.
No. 4 Band of Hope.
Band of Hope Quartz.
South Band of Hope Freehold.
Band and Barton United.
Band and Barton Consols.
Band and Barton No. 1.
North Band and Barton.
St. George and Band.
New Burra Burra.
Benn's Freehold.
Brennan's United.
Sir Garnet Wolseley.
Brünn's Freehold United.
Champion.
Lord Chelmsford.
Crescent.
Crescent Freehold.
New Crescent.
Hawthorn's Freehold.
Jones' Freehold.
South Kohinoor Freehold.
East Kohinoor.
New Kohinoor.
Pratt's.
Rose Freehold.
Serjeant's Freehold.
Smith's Freehold.
Smith's Freehold United.
Star of the East.
Wilson's Freehold.
Washington.
Young Washington Freehold.
Waterwheel.

The larger of these companies are dealt with separately, but an epitome of operations at the smaller claims, so far as ascertainable, is given below:—

*Ballarat Quartz Company.*

The Ballarat Quartz Company secured a lease in which there was an old tunnel 200 feet long and a shaft 40 feet deep, striking a quartz reef 6 ft. wide. In 1880 a shaft was sunk to a depth of 216 feet, but levels opened out east 108 feet and west 58 feet from the shaft intersected only a small mineralized spur 9 in. wide. Operations ceased early in 1881.

*Band and Barton United Company.*

The Band and Barton United Company was formed in 1881 as the result of the amalgamation of the Band and Barton Consols and the Band and Barton No. 1 companies. Prior to the amalgamation of this company with the North Band and Barton Company in September, 1882, the shaft was 610 feet deep, with workings at the 400-ft., 500-ft. and 600-ft. levels. Stoping was carried out at and above the 500-ft. level, where there was an immense body of quartz. For the twelve months ending February, 1882, 7,568 tons of quartz yielded 2,602 oz. of gold.

*Benn's Freehold Company.*

Benn's Freehold Company began operations in January, 1880. The shaft was sunk 403 feet, and, at this depth, cross-cuts east, 95 feet, and west, 74 feet, were put in. At 40 feet east of the shaft a drive was put in along a small leader 4 in. wide, and showing a little gold in country highly charged with pyrites. The 270-ft. level was also opened out with a drive 70 feet long and a winze 35 feet deep from the drive, but no payable stone was found. A rise 70 feet above the 270-ft. level broke through to the alluvial. At the 360-ft. level a cross-cut was put out 75 feet west without success, and at the 400-ft. level a winze in the east cross-cut at 30 feet from the shaft was also unsuccessful. Work ceased in March, 1882. In July the mine was let on tribute, and the east cross-cut at the 400-ft. level was extended 30 feet, passing through two makes of quartz 1 ft. wide, dipping east. As no payable ore was found the mine was closed down before the end of 1882.

*Brünn's Freehold United Company.*

The claim belonging to this company was situated near the corner of South and Raglan streets. Operations began in February, 1880. The shaft passed through 72 feet of basalt, and entered a body of drift with much water. A winding plant was installed, and the shaft was sunk to a depth of 146 feet. No further records are available.

*Band and Barton No. 1 Company.*

The Band and Barton No. 1 Company sank a shaft to a depth of 410 feet by the end of January, 1881, to cut the continuation of the stone being worked by the Young Band and Albion and the Crescent companies. In February this company united with the Band and Barton Consols to form the Band and Barton United Company.

*Band and Barton Consols Company.*

The Band and Barton Consols Company was formed in 1880, after the settlement of the litigation between the Band of Hope and Albion Consols with Barton and others (No. 1 jumps) and White and others (No. 2 jumps) (see p. 28). The ground was leased on tribute from the Band of Hope and Albion Consols for a term of fifteen years. This block included No. 8 shaft and machinery of the parent company, which was to receive 7½ per cent. of the gross yield of gold. The No. 8 shaft had been sunk to a depth of 321 feet by the original owners, and as it was perfectly dry, the expenses of the Band and Barton Consols were small. A sum of £1,200 was placed to the credit of the company when formed, and this sufficed to extend a cross-cut 310 feet east, where quartz leaders showing gold were found. A winze was sunk on this formation to a depth of 120 feet prior to amalgamation with the No. 1 Band and Barton in February, 1881.

*Band of Hope Quartz Company.*

The Band of Hope Quartz Company, which held a claim on the northern side of Darling-street, east of Skipton-street, began sinking in 1878, and by 1879 had sunk to a depth of 316 feet, where gold-bearing quartz was found. In 1880 the company became a prominent gold producer, and dividend-payer. At this time the formation had been opened for a length of 360 feet from north to south, and 300 feet of it was payable quartz from 10 ft. to 12 ft. wide.

*Crescent Freehold Company.*

The Crescent Freehold Company, formed in 1879, occupied a position north of and adjoining the Young Band and Albion Company. The shaft passed through two layers of basalt, the first at 67 feet and the second at 92 feet, where the shaft bottomed. At a depth of 151 feet the Western lode, 12 ft. wide, and carrying gold, was cut, and at a depth of 290 feet the east cross-cut passed through several gold-bearing veins, which were too small to work.

In February, 1880, the New Crescent Company took over the mine. The shaft, which was then 377 feet deep, was deepened, and the 393-ft. level was opened out. Payable quartz was cut in the east cross-cut at this level before the close of 1880. Prior to striking the payable ore, £3,450 had been called up, but towards the end of 1880 the company paid dividends. After several payments, however, the gold-bearing quartz suddenly cut out towards the end of 1881, and calls had to be paid once more. By the end of 1881 the shaft was 603 feet deep with cross-cuts started at the 600-ft. level. Payable stone was located between the 400-ft. and 450-ft. levels, but nothing of value was discovered at the 500-ft. level, although a western cross-cut was put in 200 feet and an eastern cross-cut 122 feet. A winze from the 500-ft. level was sunk on the Western lode, and connected, in 1882, with a rise from the 600-ft. level, some payable veins being found on the side of the lode. At the 500-ft. level the Eastern lode, underlying west, was found at 276 feet from the shaft, and rises were put up to the 450-ft. and 400-ft. levels: gold-bearing veins were met with in workings from these rises. By the end of 1882 the Young Band Extended lode had been proved unpayable, although opened to a depth of 500 feet. The shaft was sunk 600 feet in all.

The gold yields from the company were:—

| Year. | Ore Crushed. | Gold Yield. |
|---|---|---|
| | Tons. | oz. dwt. gr. |
| 1880 .. .. | 2,137 | 806 14 0 |
| 1881 .. .. | 7,432 | 2,717 13 2 |
| 1882 .. .. | 1,672 | 328 8 12 |
| 1885 .. .. | 189 | 675 9 7 |
| 886 .. .. | 510 | 286 12 18 |

*North Band and Albion Freehold Company.*

The North Band and Albion Freehold Company adjoined the Band of Hope and Albion Consols Company on the north. The company, formed in 1879, began shaft-sinking, and by the end of the year attained a depth of 300 feet. Shaft-sinking was then suspended until machinery was installed. The shaft passed through several large rich quartz spurs, including two at 197 feet and 225 feet respectively, each 3 ft. wide, and a third at 289 feet, which was equally rich, but smaller. In the workings a slide affected the quartz, and no defined lode was located. Early in 1880 the machinery was installed, and shaft-sinking was resumed.

In 1881 the shaft passed through a well-defined lode, which pitched south and underlay westerly and showed gold freely. The 586-ft. level north and south on this lode, proved a good shoot of payable stone from one end of the mine to the other. Another, the 617-ft. level, cut the lode west of the shaft in November, 1881. Arrangements were made to work the Band and Barton's Company's eastern ground, which consisted of a long narrow strip. In this ground the North Band and Albion Company struck the continuation of the stone then being worked by the Young Band Extended Company, whose claim was situated to the north-east. This stone proved more than payable, and before the close of 1881 the company began to distribute dividends. In 1882 the company amalgamated with the Band and Barton United Company to form the North Band and Barton Company.

The following yields were recorded from 1881:—

| Period | Ore Crushed. | Gold Yield | Dividends. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | £ |
| 1880 (last quarter) .. | 725 | 217 0 0 | .. |
| 1881 (third quarter) .. | 3,892 | 2,203 17 0 | 1,800 |
| 1882 (first half) .. | 5,698 | 1,506 1 0 | .. |

*No. 2 Band of Hope Company.*

The No. 2 Band of Hope Company had sunk its shaft to a depth of 370 feet by March, 1880, and various drives were put in to test the quartz makes passed through in sinking. At 15 feet below the 300-ft. level a spur 6 ft. to 7 ft. wide, and carrying good gold, was found. During 1880 the large bodies of quartz disclosed in the workings were found to be poor, but the smaller veins were richer, though some of them were very small. In 1881 a drive was put in on a vertical lode that showed a little gold at times. By September, 1881, the shaft was 400 feet deep. The quartz met with in the lower levels during 1882 and 1883 was poor, and in June, 1883, the mine was let on tribute. Payable ore was worked above the No. 2 level, and unsuccessful prospecting was carried out on small veins near the lode. The company was wound up in November, 1883.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. |
|---|---|---|
| | tons. | oz. dwt. gr. |
| 1880 .. .. | 2,844 | 957 11 17 |
| 1881 .. .. | 7,264 | 2,568 17 10 |
| 1882 .. .. | 1,164 | 235 18 12 |
| 1883 .. .. | .. | .. |

*North Band and Barton Company.*

The North Band and Barton Company was formed in 1882 by the amalgamation of the North Band and Albion and the Band and Barton United companies. The shaft of the original Band and Barton Company formed the No. 1 shaft of the new company. The shaft of the North Band and Albion Company, the No. 2 shaft, the shaft of the Band and Barton Consols (originally the No. 8 shaft of the Band and Albion Company), the No. 3 shaft of the new company.

By the end of 1882 most of the mining operations were carried on at No. 1 shaft, where the main lode was being stoped to a depth of 600 feet. At this level the lode was payable. At No. 2 shaft the lode was 3 ft. wide in No. 7 level, and carried fair gold.

Early in 1883 the lode worked above the 500-ft. and 600-ft. levels (No. 1 shaft) became broken and poor, and the yields fell away. By the end of 1883 the No. 1 shaft was 795 ft. deep, and the lode had been cut at 95 feet west of the shaft. At this point there was well mineralized quartz 3 ft. wide, which continued in the north drive for a length of 20 feet. South at 35 feet the stone was broken up, but winzes sunk below the level above disclosed payable ore 3 ft. wide. During 1883 12,421 tons of ore crushed yielded 4,362 oz. of gold. In 1884 a better grade of quartz was obtained from the No. 1 shaft by the opening up of the 800 ft. (No. 6) level. At the 895 ft. (No. 7) level the lode was cut at 122 feet west of the shaft. At this point it was 1 ft. 6 in. wide, broken up and poor, and under the influence of a slide, and in the drive south it continued small and poor. The good stone above the No. 6 level extended only for a short distance, and then poor stone was met with. The prospecting drives at the No. 5 level revealed only poor ore. Nothing of note was found at No. 2 shaft, where prospecting operations were continued throughout 1884, in the middle of which year dividends ceased.

In 1885 operations at No. 1 shaft were confined to driving on the lode at the No. 7 level, and to prospecting in the upper levels. All work at No. 2 shaft ceased in September. The No. 1 shaft was sunk, and the 980-ft. level was opened by the end of 1885.

During 1886 work at the 980-ft. level ceased, and the lower levels were flooded, owing to the mines on the north ceasing operations. Work was resumed at the 600-ft. level on the west side of the main lode, and a parallel line (the Christmas) was cut at a distance of 46 feet. This track was 4 in. wide, and carried 2 dwt. of gold to the ton. Prospecting in the upper levels failed to locate anything of value, and these levels were let on tribute.

In 1887 the mine was unwatered, the 700-ft. level west cross-cut was extended, and towards the end of the year the western lode-track was cut at 48 feet from the main lode, but it was small. The 800-ft. level cross-cut intersected the track at a similar distance west of the main lode. Drives

were put in 100 feet north and 60 feet south along the line with no better results, the lode then being proved small and valueless from No. 2 level to No. 6 level. At the 900-ft. level the north drive on the Consols lode intersected gold-bearing quartz, on which stoping began, but the country proved to be broken by a number of slides. The 980-ft. level was driven south through the cross-course on the lode, which kept small and poor; but at 180 feet north of the cross-cut the lode increased to 3 ft. wide, and carried visible gold for a length of 40 feet.

Shaft-sinking was resumed, and by the end of 1888 the depth was 1,080 feet. At this level the lode was cut by a cross-course near the cross-cut. In the north drive the lode was small for 130 feet, and did not improve in value as far as the boundary of the lease. In the south drive for 170 feet the lode averaged 8 in. wide, and was poor, and in the remainder of the level, which was continued to within 70 feet of the south boundary, it was only a small track.

Further shaft-sinking began in October, 1889, and during 1890 the 1,180-ft. and 1,280-ft. levels were opened. At the 1,280-ft. level a diagonal drive was put in north-westerly to cut the stone then being worked by the adjoining Sir Henry Loch Company. This lode, 3 ft. wide, and carrying visible gold, was cut at 110 feet south of the boundary. The 1,180-ft. level cross-cut intersected the lode where it was 2 ft. wide carrying a little gold. The drive on the lode at 1,280-ft. level proved the stone to carry about 6 dwt. of gold to the ton up to the boundary, but during 1891 work in this part of the mine was stopped. An east cross-cut at the 1,280-ft. level passed through a pyritic seam at 211 feet, and a track at 330 feet, but it proved nothing of value between this point and the end at 400 feet. At the 1,180-ft. level the drives from boundary to boundary revealed nothing of value. At No. 2 shaft a block of ground was secured from the Band and Albion Consols Company in 1891, and was worked on tribute with fair results. In 1892 the lower levels were abandoned, and the upper levels were worked on tribute. The tributers were successful in locating payable ore, and during 1893 they maintained a good output from veins east of the shaft at Nos. 1, 2, and 3 levels.

In 1894 the average yield was low, and the spurs were small. The cessation of operations in the mines to the south and the closing in of the old shafts made ventilation difficult for a time. The quality of the veins improved slightly in 1895, but nothing profitable to the company was found.

During 1895 the company amalgamated with the Sir Henry Loch Company to form the Sir Henry Loch United Company (see p. 156). Prior to amalgamation the following yields were obtained:—

| Year. | Ore Crushed. | Gold Yield. | Dividends. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | £ s. d. |
| 1882 (6 months) .. | 8,429 | 3,877 15 0 | 4,933 17 0 |
| 1883 .. .. | 10,376 | 3,846 16 0 | 2,446 0 0 |
| 1884 .. .. | 6,154 | 2,797 12 6 | .. |
| 1885 (1 quarter) .. | 1,039 | 396 13 0 | .. |
| 1886 (3 quarters) .. | 1,152 | 305 12 10 | .. |
| 1887 (half year) .. | 345 | 80 18 6 | .. |
| 1888 (3 quarters) .. | 666 | 185 15 15 | .. |
| 1891 (half year) .. | 570 | 130 4 0 | .. |
| 1892 .. .. | 1,428 | 269 16 12 | .. |
| 1893 (3 quarters) .. | 1,552 | 451 7 0 | .. |
| 1894 .. .. | 2,084 | 643 13 12 | .. |
| 1895 (2 quarters) .. | 1,943 | 359 5 0 | .. |

*Sergeant's Freehold Company.*

Serjeant's Freehold Company was formed in August, 1878, to work a claim extending 440 feet along the line of the Consols reef. In the shallow levels the country was much broken, and quartz spurs were frequent, some highly payable, and others poor. By the 9th of October, 1879, the company had crushed 228 tons of quartz, averaging 9 dwt. 16 gr. of gold to the ton. This stone came from a depth of 220 feet. Stoping below this level was carried on while the shaft was being sunk at the close of 1879.

Early in 1880 the 280-ft. level was opened out, and cross-cuts passed through a body of quartz 70 ft. wide, extending from 30 feet east of the shaft to 70 feet west of the shaft. The cross-cuts were extended to 185 feet east and 135 feet west of the shaft. The quartz, which was followed north to the Band of Hope Company's boundary, carried payable gold all the way, and a large amount of ore was won. By the end of 1880 the 452-ft. level was being opened up. At this depth the formation, which was 140 ft. wide on the northern boundary, yielded a large quantity of ore. A rise at the boundary proved quartz for 70 feet above the level. The south drive was connected with the Crescent Company's workings, where a large quantity of payable ore was proved. Levels were opened at 425 feet, where a large body of quartz was cut, and at 476 feet, where the country proved to be hard, and to carry little quartz. At 155 feet west of the shaft in the 476-ft. level a well-defined lode 5 ft. wide, between good walls, was cut, and was followed south to the boundary of the claim, where a winze was sunk to a depth of 50 feet. This lode was so promising that the sinking of the main shaft was resumed in July, 1881. The Eastern lode workings in the upper levels provided the bulk of the ore for crushing, the ore in the stopes at the 476-ft. level being poor.

In 1882 a large body of quartz was found between the two lines of reef country, and at the 450-ft. level good payable quartz was found at 125 ft. east of the shaft. This stone did not rise above the level in 300 feet of driving along its course, but proved payable. The Western reef was from 5 to 6 ft. wide at the 450-ft. level.

During 1881 and 1882 the quartz crushed gave satisfactory returns, but in 1883 its value fell away. At this time payable stone was found on the Western lode, the shaft was sunk to a depth of 570 feet, and the lode was cut at 185 feet from the shaft early in 1883. It was poor where cut, but, although it improved when driven on south, it was not payable, and rises on it were also unsuccessful in locating anything payable. A cross-cut 200 feet east at the 570-ft. level met with no better results. A body of payable quartz was found 14 feet above the 460-ft. level at 50 feet east of the Western reef, and this was worked for a length of 120 feet, where the payable stone died out.

In 1884 and 1885 a large output was maintained; but, as the greater part of the workings were let on tribute, the company's profits were small. A small dividend was paid in 1885. Most of the ore came from the 340-ft. level and above. In 1886 the yields fell away considerably, but operations were continued by various tributers until the end of 1887.

The following yields are recorded:—

| Year. | Ore Crushed. | Gold Yield. | Dividends. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | £ s. d. |
| 1879 (9 months) .. | 1,632 | 660 5 6 | .. |
| 1880 .. .. | 9,501 | 2,879 17 0 | 900 0 0 |
| 1881 .. .. | 18,724 | 3,967 17 0 | 2,000 0 0 |
| 1882 .. .. | 15,211 | 3,190 3 0 | .. |
| 1883 .. .. | 9,270 | 2,074 13 2 | .. |
| 1884 .. .. | 7,183 | 2,138 5 12 | .. |
| 1885 .. .. | 8,347 | 5,193 7 0 | 350 0 0 |
| 1886 .. .. | 3,882 | 1,072 16 22 | .. |
| 1887 (1st quarter) .. | 470 | 63 18 12 | .. |

SCANDINAVIAN COMPANY.

The Scandinavian Company erected a battery on the bank of the Yarrowee Creek in 1858, and worked a prospecting claim on the Scandinavian or White Horse reef. The company employed 20 men, and the machinery consisted of a 12-head battery and a 10 h.p. engine. The yield from the quartz varied, but the general average in September, 1858, was 15 dwt. to the ton. Weekly dividends were as high as £20 per man.

SIR HENRY LOCH COMPANY.

The Sir Henry Loch Company was formed in 1884, taking over the claim of Smith's Freehold United Company, and it was reorganized in 1885. The shaft was enlarged, and sinking was recommenced at 770 feet from the surface before the end of the year. By August, 1887, the shaft was 923 feet deep, and a cross-cut was put in to the lode at the 852-ft. level. Drives north and south on the lode proved 10 dwt. ore, and a rise above the level 6 dwt. ore. The lode ranged from 2 ft. to 8 ft. wide. In 1888 a cross-cut at the 963-ft. level was opened to the lode, which varied from 10 in. to 2 ft. wide, and contained payable gold and pyrites; 670 tons of quartz taken out from 225 feet of driving yielded 602 oz. of gold. Payable ore was proved to 269 feet north and 317 feet south of the cross-cut at this depth. Early in 1889 the 1,072-ft. level was opened out to the lode at 181 feet from the shaft; this located a fine body of very payable quartz, which extended northwards to the boundary and southwards for 250 feet from the cross-cut. The New Kohinoor Company, under agreement, worked the northern extension of the payable stone from the 963-ft. and 1,072-ft. levels in the Sir Henry Loch mine until 1892.

By the end of 1889 a plat was cut at the 1,181-ft. level, and a cross-cut was started west for the lode, which was cut early in March, 1890. As development was ahead of stoping, nothing was done at this level for a considerable time beyond driving 350 feet on the course of the lode, the 1,072-ft. and 963-ft. levels yielding abundance of payable ore. Stoping above the level began in September, 1890. Early in 1891 the lode was cut at the 1,291-ft. level; it varied from 1 ft. to 5 ft. wide in the drive for over 100 feet on either side of the cross-cut, but to the north the payable stone was found to cut out. In August, 1891, a cross-cut was opened out at the 1,400-ft. level, and early in 1892 it intersected the lode, which varied from 2 ft. to 5 ft. wide, and was payable.

In September, 1892, the cross-cut west at the 1,509-ft. level cut the lode at 310 feet from the shaft. In the north and south drive the lode averaged 2 ft. 6 in. wide, and was of fair value. The quartz continued northwards to the boundary.

In November, 1893, a cross-cut opened west at the 1,620-ft. level cut the lode, which varied in width from 6 in. to 3 ft. A rise connected to the level above, and stoping began from an intermediate level on quartz 1 ft. 6 in. wide. A slide or fault between the 1,620-ft. and 1,509-ft. levels disturbed the lode, which diminished in size and value. The north drive at the 1,620-ft. level was extended to the boundary, and the south drive to 245 ft. from the cross-cut. In 1894 two winzes were also sunk below the level in ore similar in appearance to that in the levels above, but mostly of low value. The supply of payable ore in sight was limited, the lode being broken throughout the full length driven above the 1,620-ft. level. During the latter part of the year 1894, a cross-cut at the 1,730-ft. level reached the lode where it was also broken up, the track being filled with crushed slate and a little quartz. Early in 1895 various tributes in the upper levels were granted, and resulted in small bodies of payable stone being located. Difficulty with water arose, owing to the stoppage of pumping at the Kohinoor mine on the north, and at the North Band and Barton mine on the south, and in August, 1895, the Sir Henry Loch Company was wound up and the Sir Henry Loch United Company was formed.

The following are the recorded yields:—

| Quarter Ending-- | Ore Crushed. | Gold Yield. |
|---|---|---|
| | tons. | oz. dwt. gr. |
| March, 1888 .. | 1,380 | 693 14 18 |
| June, 1888 .. | 860 | 428 0 18 |
| September, 1888 | 410 | 393 7 6 |
| December, 1888 | 1,393 | 1,045 13 0 |
| March, 1889 .. | 2,240 | 1,787 19 0 |
| June, 1889 .. | 2,173 | 1,895 5 12 |
| September, 1889 | 2,790 | 1,860 19 6 |
| December, 1889 | 2,825 | 2,232 7 0 |
| March, 1890 .. | 2,673 | 1,713 11 16 |
| June, 1890 .. | 3,217 | 2,151 8 0 |
| September, 1890 | 3,193 | 2,252 3 6 |
| December, 1890 | 3,348 | 2,123 18 0 |
| March, 1891 .. | 3,193 | 1,958 3 0 |
| June, 1891 .. | 3,713 | 1,972 3 0 |
| September, 1891 | 3,463 | 2,132 9 12 |
| December, 1891 | 2,841 | 1,770 1 0 |
| March, 1892 .. | 3,298 | 1,661 12 0 |
| June, 1892 .. | 3,027 | 1,551 10 0 |
| September, 1892 | 2,223 | 912 19 0 |
| December, 1892 | 961 | 826 18 0 |
| March, 1893 .. | 2,610 | 2,060 7 0 |
| June, 1893 .. | .. | .. |
| September, 1893 | 1,390 | 1,184 18 0 |
| December, 1893 | 1,982 | 1,956 11 0 |
| March, 1894 .. | 2,210 | 1,679 9 0 |
| June, 1894 .. | 1,807 | 1,260 8 0 |
| September, 1894 | 1,173 | 691 5 0 |
| December, 1894 | 1,044 | 440 9 12 |
| March, 1895 .. | .. | 453 3 0 |
| June, 1895 .. | .. | .. |
| September, 1895 | 498 | 237 6 12 |
| December, 1895 | .. | .. |

The following are the available particulars of earnings and expenditure from the inception of

the Sir Henry Loch Quartz Mining Company to 22nd August, 1895:—

Paid-up capital, £12,000.
Gold won, 43,563 oz. 17 dwt. 18 gr.; value, £180,321 18s. 3d.
Dividends, £63,600.
Wages, £64,940.
Royalty, £12,933.
Total expenditure, £196,290 16s. 2d.

SIR HENRY LOCH UNITED COMPANY.

The new company secured a larger holding than the original company's. The Sir Henry Loch United Company repaired the south drives leading towards the North Band and Barton mine at the 1,400-ft. and 1,509-ft. levels, and extended them from 265 feet and 246 feet respectively to 390 feet and 497 feet. During 1896 several thousand tons of quartz were raised from an intermediate level and from stopes between these drives. The North Band and Barton shaft was repaired, and now formed the No. 2 shaft, and was connected at Nos. 8 and 9 levels with the 852-ft. and 963-ft. levels from the main shaft. This portion of the claim was let on tribute, and so worked until September, 1896, when operations ceased after 1,154 tons had been treated for 238 oz. of gold. The working of this shaft was a drain on the profits from the main shaft, and operations were concentrated to driving under this portion of the mine at 1,509-ft., 1,620-ft. and 1,730-ft. levels. By the end of 1896 the 1,620-ft. level was extended 200 feet in the south ground, and was connected with the 1,509-ft. level by a rise. The south face of the 1,509-ft. level in September, 1897, was 709 feet from the cross-cut; the ore crushed during the previous six months came from this part of the mine, and yielded sufficiently well for £1,625 to be paid in dividends as well as £908 in royalty.

In 1897 the southern ground was further exploited. The 1,620-ft. level at 562 feet south of the cross-cut carried a body of stone 10 ft. wide, only the eastern portion of which was tested. At the 1,730-ft. level an angle-drive aimed at cutting the lode south of the former workings, in what was regarded as settled country; at 140 feet from the cross-cut the lode was intersected, but was found to be still in broken country, which continued for 100 feet, but beyond this a solid lode of poor quartz, from 1 ft. to 3 ft. wide, was driven on to 405 feet from the cross-cut. An intermediate level was put in from a winze sunk from the 1,620-ft. level in the south ground. In this intermediate level the lode for 90 feet north averaged 2 ft. 6 in. wide, and showed fair gold, while south at 80 feet from the winze the lode was 5 ft. wide, but poor. In the 1,730-ft. level the south drive at 454 feet from the cross-cut proved the lode to be 9 ft. wide but poor, and driving was discontinued towards the end of 1897. Stoping above and below the intermediate level, chiefly north of the winze, yielded payable crushings, but no dividends were paid after the early part of 1897.

Early in 1898 a winze was sunk below the 1,730-ft. level, and at 108 feet a cross-cut was driven east from the winze. This cross-cut intersected at 39 feet a body of dark laminated quartz 2 ft. wide, showing fair gold, and below the influence of the faulted country. Drives north and south on this quartz were begun in July, 1898, and all other operations in the mine ceased, the payable ore being exhausted. In the north drive from the winze the lode to 78 feet averaged 2 ft. wide, and the face at this point showed good gold. A winze below this drive proved the lode to a depth of 23 feet to average from 2 ft. 6 in. to 3 ft. wide and to carry fair gold. The lode had well-defined walls with a westerly underlie. South from the winze the drive was put in 47 feet, and a rise proved that the dark laminated quartz cut out at 16 feet above the drive. A crushing of 120 tons of ore from these workings yielded 84 oz. of gold; this was not payable, and operations at the mine ceased. The stone was subsequently mined after the company had amalgamated with the Band of Hope and Albion Consols to form the Band and Loch United Company (see p. 171) towards the close of 1898.

The following are the recorded yields:—

| Quarter ending | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| June, 1896 .. | 3,074 | 1,635 | 10 | 0 |
| September, 1896 | 2,621 | 672 | 7 | 0 |
| December, 1896 | 2,661 | 1,667 | 15 | 0 |
| March, 1897 .. | 2,727 | 1,459 | 10 | 0 |
| June, 1897 .. | 2,972 | 1,269 | 19 | 0 |
| September, 1897 | 2,241 | 955 | 14 | 0 |
| December, 1897 | 2,374 | 711 | 16 | 0 |
| March, 1898 .. | .. | 66 | 5 | 0 |
| June, 1898 .. | .. | .. | | |
| September, 1898 | 120 | 88 | 3 | 0 |

The returns from the Sir Henry Loch United Company to September, 1898, were as follows:—

Capital, £4,461 11s.
Value of plant, £4,500
Gold won, 10,679 oz. 13 dwt. 17 gr.; value, £44,136 5s.
Dividends, £6,500.
Royalty, £3,563 12s. 9d.
Wages, £21,456.
Total expenses, £54,556 12s. 4d.

SMITH'S FREEHOLD UNITED COMPANY.

Smith's Freehold United Company was formed in 1878. Shaft-sinking began, and prospecting for the Band and Albion line of lode was carried on continuously with little success until towards the end of 1881. At the beginning of 1882 the 605-ft. level had just been opened out, and the lode, 2 ft. to 3 ft. wide, was cut at 29 feet from the shaft. At 12 feet south of the cross-cut was a cross-course or slide beyond which some rich specimens were found, but the lode went underfoot. At the 700-ft. level the lode was cut at 71 feet west of the shaft; at this point it was a solid, well-defined, highly-mineralized body, with gold showing freely. In the south drive the lode averaged 3 ft. wide, and yielded over ½ oz. of gold to the ton. By the end of 1882 the shaft had been sunk to a depth of 780 feet. At 730 feet it passed through a lode-track underlying flat to the west; this was cut at 45 feet in the west cross-cut at the 780-ft. level, and beyond it quartz spurs extended to the Western lode over a width of 20 ft. The Western lode at this level was solid, well-defined, from 6 ft. to 7 ft. wide, and gold-bearing, but unpayable. At the 700-ft. level a drive was put in for 174 feet along the lode; the quartz was 3 ft. to 4 ft. wide, and averaged from 5 dwt. to 10 dwt. to the ton, but it did not extend far above the drive. Sinking and

stoping were carried out north of the cross-cut for a depth of 25 feet and a length of 95 feet, with encouraging prospects, but the water became too heavy to be dealt with, and work ceased in July, 1883. The north drive at the 780-ft. level proved the lode to average 2 dwt. of gold to the ton for the first 70 feet, and 4 dwt. for the next 70 feet; a cross-course then heaved the lode 5 feet west, and for 100 feet beyond this it carried little or no quartz. Stoping between the cross-cut and the cross-course was carried out to a height of 45 feet to a slide, which heaved the lode 15 feet east, above which no payable ore was met with.

The following yields from the Smith's Freehold United Company were recorded from 1880:—

| Year. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | |
| 1880 .. | 200 | 32 14 0 | 400-ft. level |
| 1881 .. | 2,200 | 240 14 17 | 600-ft. level |
| 1882 .. | 2,881 | 866 14 12 | 600-ft. level |
| 1883 .. | 4,097 | 751 10 10 | 700-ft. to 780-ft. level |

SMITH'S FREEHOLD COMPANY.

Smith's Freehold Company, a co-operative party, was among the successful companies of the group.* Shaft-sinking began in 1879, and by the end of the year the shaft was down 275 feet. In 1880 poor quartz was treated, but early in 1881 rich quartz was being won from the 290-ft., 361-ft., and 421-ft. levels, and at the 361-ft. level the quartz lying east of the main lode was from 50 ft. to 60 ft. wide. At the 421-ft. level the quartz was payable from the northern to the southern boundary of the mine, and for 10 feet above the level.

In 1882 the east cross-cut at the 361-ft. level cut the eastern portion of the lode, which consisted of small quartz veins in slate 30 ft. wide, followed by a solid body of quartz 10 ft. wide. A rise on this formation proved quartz which was gold-bearing, but not in payable quantity. The 483-ft. level was opened out in April, 1882, and a number of spurs were found on the eastern side of the lode at 120 feet from the shaft. Drives north and south, as well as stopes, were opened out on these spurs during 1882. The payable stone extended to a height of 20 feet above the level. Operations were continued until 1883.

The following yields from the Smith's Freehold Company were recorded from 1877:—

| Year. | Ore Crushed. | Gold Yield. | Remarks. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | |
| 1877 .. | 1,590 | 112 10 0 | |
| 1880 .. | 6,490 | 2,006 11 19 | 295 ft. to 420 ft. |
| 1881 .. | 14,727 | 3,730 0 12 | Dividends, £4,900, 420 ft. |
| 1882 .. | 6,418 | 1,831 12 14 | Dividends, £1,212, 420 ft. to 430 ft. |
| 1883 .. | 4,636 | 1,370 3 9 | Dividends, £800, 400 ft. to 480 feet. |

SOUTH CANADIAN COMPANY.

The South Canadian Company erected a battery of twelve heads in Prince Regent Gully in 1860. Quartz spurs were mined in a cutting on the north side of the gully, and the average return from them was under 5 dwt. to the ton. About 250 tons of quartz were crushed per week, and by the end of November, 1860, small dividends were paid to the eight shareholders.

* Bodan and adjacent group of mines.

The following yields were recorded:—In 1860 100 tons yielded 26 oz.; and in 1861 a crushing of 600 tons from 150 ft. deep averaged 2 dwt. 19 gr. to the ton, and another of 250 tons from 125 ft. deep 2 dwt. 12 gr. to the ton.

SOUTH PLATEAU COMPANY.

The South Plateau Company began operations in 1887. At 150 feet the shaft passed through a flat spur 6 ft. wide and carrying visible gold. Levels were opened at 200 ft. and 300 ft. from the surface, and the cross-cut east at the 200-ft. level passed through several veins, some of which carried a little gold. Between 320 feet and 380 feet the shaft passed through some mineralized spurs.

Operations ceased in 1888, but were resumed in May, 1889, when a drive was opened on a spur that had been found at 60 feet from the surface during shaft-sinking. A few feet from the shaft this spur widened out to 3 ft. A trial crushing of 108 tons yielded 46 oz. of gold, and this led to the opening out of a level at a depth of 135 feet. A rise put up from the 135-ft. level at 80 feet east of the shaft cut the spur at 20 feet above the level, and a cross-cut 20 feet further east also intersected the quartz; drives north and south were put in, the quartz varying from 1 ft. 6 in. to 2 ft. 6 in. wide and averaging over 7 dwt. of gold to the ton in 1890. At the 300-ft. level a lode was cut at 115 feet east of the shaft, and a drive was put in for 500 feet along its course; it was from 1 ft. to 3 ft. wide, and mineralized.

By the end of 1890 the shaft was 705 feet deep, and the 600-ft. and 700-ft. levels had been put in. A battery was erected and 540 tons of ore from the stopes above the 135-ft. level yielded 130 oz. 16 dwt. of gold.

In 1891 cross-cuts east 132 feet, and west 428 feet, at the 600-ft. level were put in without meeting anything of value. At the 500-ft. level a drive 100 feet east of the shaft was put in for 550 feet south along a mass of spurs, and a cross-cut east passed through a cross-course at 400 feet and was continued to 503 feet; then, as this failed to locate the continuation of the quartz proved in the levels above, the levels to a depth of 300 feet were let on tribute. At the 700-ft. level the cross-cut intersected a lode-track at 160 feet west of the shaft, and a drive was started to the north along it.

During 1892 no favorable indications were met with in any of the drives, and early in 1893 the attention of the company was directed to the alluvial within the claim. Drives were opened out from rises above the 300-ft. level, and the ground between the Raglan and Cobbler's gutters was prospected without success. Tributers continued this work in 1894, and drove a total distance of over 800 feet before operations ceased in April, 1894.

In 1895 work was resumed by the company, which was now known as the South Star Extended.

SOUTH STAR EXTENDED COMPANY.

The South Star Extended Company began operations towards the close of 1895, and extended the western cross-cut at the 700-ft. level, which was already 164 feet long, repaired the 500-ft. level, and did some further driving there. In the 700-ft. level cross-cut a track was intersected at 300 feet west of the shaft, and drives

were put in north and south along it; in the north drive mineralized quartz was followed for 90 feet, and in the south drive the quartz varied from 1 ft. to 2 ft. 6 in. wide and carried a lot of black-jack and galena for 150 feet, but for the next 60 feet the lode became merely a track.

In 1897 the claim and plant of the Central Plateau Extended Company (formerly known as the North Bonshaw) were purchased, and the leases were amalgamated. A shaft on the newly-acquired ground bottomed at 160 feet, and was sunk to a depth of 250 feet; this became the No. 2 shaft of the South Star Extended Company, which abandoned its main shaft in February, 1898, and began sinking at this No. 2 shaft. Sinking below 250 feet was done on contract; the shaft was deepened 200 feet in eight weeks, but then machinery had to be installed to cope with the water, and the shaft was continued to 640 feet. Cross-cuts were started east and west at a depth of 625 feet; the eastern cross-cut was put in 1,530 feet and the western cross-cut 912 feet from the shaft. In both cross-cuts changes in the direction of the dip of the strata were recorded, but, as no large formations were met with, little driving was undertaken. From the mine manager's weekly reports the following particulars were obtained:—In the east cross-cut, hard sandstone with small bars of slate and occasional leaders of quartz extended from the shaft to 275 feet, where a lode-track 1 in. wide was driven on south for 370 feet; clean country was passed through to 420 feet, where there was a black slate, followed by mineralized slates and occasional black slates to 500 feet. For 600 feet from the shaft the strata dipped west, but from 600 feet to 700 feet easterly dips were mentioned; near the latter point the dip changed, and some hard bars of sandstone were passed through, with much water at times. At about 1,000 feet from the shaft mineralized slates and sandstones were found. At 1,150 feet a formation of quartz 4 in. wide and black slate of promising appearance was cut, and then slates and sandstones with quartz leaders, the strata dipping west to 1,250 feet. A change of dip (syncline) occurred at 1,350 feet, and beyond this west-dipping beds extended to the face. A black and highly-mineralized track 3 in. wide was intersected at 1,435 feet; another 2 in. wide at 1,524 feet; and a third 4 in. wide at 1,530 feet. These tracks were the continuation of the Prince of Wales lode, and they correspond to those in the Sebastopol Plateau No. 1 mine (see p. 194). As the face of the cross-cut was nearly on the boundary and as the lode-tracks were small, no driving was carried out on these tracks. Work in the east cross-cut ceased in November, 1901.

In the west cross-cut at 625 feet, the strata dipped west for over 200 feet. The country was hard with an occasional quartz spur containing a little mineral and a large blow of quartz carrying galena and black-jack at 190 feet from the shaft. From 200 feet to 400 feet the strata dipped east, but from this point to the face at 914 feet the only recorded dips were westerly. The beds consisted of alternating slates and sandstones. As no reefs of value were located in this cross-cut, a level was opened from the shaft at a depth of 200 feet, and a drive was put in south; this broke through into wash at a distance of 100 feet from the shaft. A cross-drive of 47 feet along the wash proved that the surface of the bedrock had a southerly fall. Another level (245 ft.) was then opened in the shaft, and a south drive from it cut the alluvial at 207 feet; it contained much water, and as the ground still dipped south, no further work was carried out.

The failure of the company to locate a payable reef was the more unfortunate as a payable quartz reef was reputed to have been found in former times by the Prince of Wales Company in its alluvial workings within the boundaries of the lease held by the South Star Extended Company.

SOVEREIGN (BALLARAT EAST) COMPANY.

The Sovereign Company, originally known as the Ballarat East Company, occupied a position on the summit of the range immediately south of Golden Point, where the alluvial deposits were first worked. In 1868 a shaft was sunk to a depth of 100 feet, and a cross-cut was driven at this level to intersect Brown's reef, which had been worked by the Speedwell Company with payable results. In October the shaft was enlarged to 9 ft. by 3 ft., and sinking was then resumed. Early in 1869 shaft-sinking revealed two leaders between 100 feet and 125 feet from the surface, one 2 ft. and the other 1 ft. wide. A cross-cut at the 150-ft. level intersected two much-broken, west-dipping lodes east of the shaft, and at 160 feet west of the shaft a lode 12 ft. wide.

The shaft passed through a small leader carrying gold (February, 1869) at 175 feet from the surface; a quartz spur 2 ft. 6 in. wide showing gold at 203 feet; another gold-bearing spur at 344 feet, and a large body of auriferous quartz carrying much water at 372 feet. By October, 1869, the shaft was 442 feet deep, and driving for the Speedwell lode was begun at a depth of 415 feet. In November the faces on this lode, which was 45 feet east of the shaft, disclosed large bodies of quartz carrying coarse gold and a quantity of auriferous pyrites. A rise to the 360-ft. level was put up in a solid body of quartz.

In March, 1871, the mine was sold as a going concern to Mr. Luth for £4,000; a new company was formed, and a scheme for deep sinking was initiated, which met with much local opposition at its inception. By April, 1872, the shaft had reached a depth of 527 feet, the last 16 feet in payable quartz. At 537 feet the shaft entered the cap of a payable west-dipping formation, which continued in the shaft for 25 feet, and at 600 feet from the surface it passed through more quartz. Sinking was continued to 650 feet, which depth was attained by the end of the year 1872.

At this time the mine workings comprised:—300-ft. level, a plunger chamber and cross-cut 40 feet to the west; 360-ft. level, a plat and cross-cuts east 50 feet and west 30 feet, with quartz in both cross-cuts; 415-ft. level, a plat and a cross-cut west 162 feet and east 489 feet, 200 feet of which was driven by the present company, leaving, it was supposed, 60 feet to be driven to cut the line of the Queen Victoria lode; 500-ft. level, a cross-cut east 90 feet and west 80 feet to some quartz; 570-ft. level, a chamber on the north and south sides of the shaft showing a large body of quartz. The crushing material was being mined at the 570-ft. level.

In 1873, prospecting was carried out in the shallow levels with little success. The principal supply of ore came from the stopes at the 640-ft. level. The shaft between 650 feet and 720 feet was chiefly in quartz. A level (710 ft.) was opened out about the middle of the year. At the

570-ft. level a cross-cut was put out west, and by the end of the year 1873 the face was 600 feet from the shaft. The large make of quartz cut in the shaft gave out in the north drive, but, after a blank of 40 feet, it made again, and became larger and richer. At the 640-ft. and 710-ft. levels, slides displaced the lode, and between these slides the country was much broken. By the end of the year the shaft was 760 feet deep.

In 1874, tributers opened out a cross-cut east between the 640-ft. and 570-ft. levels, and after driving 10 feet struck a new ore body, which ranged up to 30 ft. wide by a thickness of 20 ft., and extended both north and south. The gold yields fell off during the latter part of the year. Less quartz was obtained from the 570-ft. level, where the drive for 400 feet north of the shaft passed through disturbed country almost devoid of quartz. At the 710-ft. level a party of tributers (Sampson and mates) began work in November, and opened up a large body of quartz 14 ft. to 17 ft. wide, and carrying from 3 dwt. to 4 dwt. of gold to the ton. This discovery induced the company to sink the shaft deeper, and to open out at 70 feet below the 710-ft. level. The 500-ft. level carried good payable ore, but the other levels were uninviting throughout the year, and were let on tribute.

In 1875 the shaft was deepened, and the 780-ft. level was opened out. During the first half of the year the 710-ft. level supplied large bodies of ore, carrying 7 dwt. to 8 dwt. of gold to the ton. The upper levels were worked by tributers with fair results. By the end of the year the shaft was 800 feet deep, and the lode, where intersected by the 780-ft. level cross-cut, yielded 8 dwt. of gold to the ton, the richest stone yet struck, but the supply of ore of this quality was small. A new battery was installed.

In 1876 the yields fell away. At the 780-ft. level the north drive on the Black lode was put in on contract. At the 400-ft. level the south drive passed through a cross-course, and the lode where picked up beyond this was 3 ft. wide and well defined. At the 300-ft. level the east cross-cut intersected the Speedwell lode, and was let on tribute. At the end of the year the north drive at the 780-ft. level was extended 200 feet along a poor vertical lode, and the south drive was in 232 feet; a trial crushing from these drives not being satisfactory, work was suspended at the 780-ft. level. The 710-ft. 640-ft., and 570-ft. levels were in bad order, and the 500-ft. and 400-ft. levels were worked by tributers; at the latter level work was in progress on a flat leader over 500 feet north of the shaft. A trial crushing from a vein 100 feet north of the shaft yielded 4½ dwt. of gold to the ton. At the 260-ft. level a cross-cut east for 700 feet passed through the Western Slates and the Indicator, and several lodes and a drive was put in on the Western Slates.

In 1877 the only work at the mine was that carried on by tributers, who obtained 138 oz. 10 dwt. of gold from a crushing of 436 tons from the 400 ft. level. Two rises, one on the Western Slates and the other on the Indicator, were put up without satisfactory results, and in 1877 the company was wound up.

The yields from this mine recorded in the company's half-yearly reports and in the Mining Registrar's reports do not agree. The discrepancies are probably due to the fact that the Sovereign Company's battery crushed for other companies, and to the Mining Registrar inserting the total crushings as if they all came from the Sovereign mine.

The following yields are recorded:—

| Period. | Company's Records. | | Mining Registrar's Records. | |
|---|---|---|---|---|
| | Ore Crushed. | Gold Yield. | Ore Crushed. | Gold Yield. |
| | tons. | oz. dwt. gr. | tons. | oz. dwt. gr. |
| September to December, 1869 | .. | .. | 300 | 44 0 0 |
| Quarter ending March, 1871 | .. | .. | 350 | 35 0 0 |
| Quarter ending December, 1872 | .. | .. | 700 | 80 0 0 |
| 1873 .. .. | 11,350 | 1,584 5 18 | 12,700 | 1,898 6 9 |
| 1874 .. .. | .. | 2,041 8 18 | 15,798 | 2,458 15 4 |
| 1875 .. .. | .. | 1,983 19 0 | 12,900 | 2,288 14 12 |
| 1876 .. .. | .. | .. | 10,790 | 1,463 5 14 |

SPEEDWELL COMPANY.

The Speedwell Quartz Mining Company, of 20 shareholders, was formed in 1859, and began operations on a claim at Poverty Point. Two shafts were sunk, and gold was struck in one at a depth of 60 feet in April, 1860. By October a battery of twelve heads was erected, and crushing began, but the stone was poor, and the battery lay idle while further sinking was carried on. In January, 1861, good ore was struck, and nine days' crushing yielded 159 oz. of gold. A furnace for roasting the pyrites before extracting the gold by amalgamation was erected in 1861, and proved to be a success. The tailings from the sand pits were sent below to fill the stopes. Regular dividends of £10 to £20 per share were paid during 1861 from 7-dwt. quartz, mined at a depth of 190 feet, but in 1862 the yields fell away. The shaft was then deepened, and the reef was cut at 216 feet, where it was 5 ft. to 8 ft. wide, and at 250 feet, where it was 40 ft. wide. About this date—October, 1862—the New Speedwell Company was formed, and took over the property (see p. 139).

The yields recorded are:—

1861 .. .. .. 852 oz.
1862 .. .. .. 502 oz.

After the New Speedwell Company gave up the claim, another company, called the Speedwell, took possession in 1876. This company obtained the following results:—

| Year. | Ore Crushed. | Gold Yield. | Depth. |
|---|---|---|---|
| | tons. | oz. | feet. |
| 1876 .. .. | 420 | 30 | 130 |
| 1877 .. .. | 1,971 | 859 | 200-300 |
| 1878 .. .. | 500 | 75 | 300 |
| 1879 .. .. | 624 | 229 | 180 |

During 1880 a tribute party worked at a depth of 250 feet with poor results until 1883, when a party of 22 men on tribute sank the shaft to 310 feet, and drove a level at this depth to the northern boundary, a distance of 325 feet, where they put up a rise 20 feet, and connected with a former whim-shaft. In this rise good gold-bearing veins were located on the Indicator, Streaky Slate, Pencil Mark, and across to the Black Seam. The yields from the mine rose from a few ounces to upwards of 250 oz. per fortnight, and the dividends per man to £28 10s. per fortnight, after paying 22½ per cent. to Costin, who

held the claim till his death. After this event the mine was purchased by Miss Cornwell ("Madam Midas") on behalf of a syndicate for £7,500, and the tribute party (Tregurtha and others) sold their tribute for £2,400.

Prior to Miss Cornwell securing the mine the returns from the area were about 40,000 oz. About 1887 the Speedwell Proprietary Company took over the mine, and deepened the shaft to locate the continuation of the rich stone worked in the shallow levels, and which was cut off by a slide or leather-jacket. In 1890 the discovery of the Black Seam below the fault gave an indication of the total amount of displacement caused by the leather-jacket. The yields for 1890 were better than those of the preceding year.

Early in 1891 the Indicator was picked up at the 510-ft. level, and drives were begun north and south on its course. A rise in the north drive passed through several gold-bearing veins crossing the Indicator. The upper levels provided an abundance of payable quartz during the year, many tributers being employed.

In 1892 an air shaft was commenced south of the main shaft, and quartz of good quality was opened up. A specimen containing 62 oz. of gold was taken from the workings in this shaft.

In 1893 the shaft was deepened. The 630-ft. level was opened in several flat leaders, and below this a large body of quartz 12 ft. wide was found in the shaft. At the 630-ft. level the Indicator was 60 feet west of the shaft, and a north drive put in along some veins on it yielded some fine specimens, including one of 30 oz. South a payable vein was driven on. At the 500-ft. level a large cross-course was found about 580 feet south of the main shaft, and a drive was put in for 150 feet along its course without locating the Indicator. A winze was put down on the south side, but was abandoned owing to heavy water. Large bodies of quarts were still available in the 390 ft. and shallower levels, and also from shallow shafts on the lease.

In 1894 the 700-ft. level was opened, and the Indicator was located at 60 feet west of the shaft. At the 630-ft. level the north drive was continued to the boundary, where a rise of 120 feet connected with the Llanberris Company's workings and passed through payable veins. A drive was put in south for 650 feet from the shaft. Plenty of payable ore was still available in the shallow levels.

In 1895 the yield improved considerably, although the output of quartz was slightly smaller, an average of about 1,000 tons a month being milled. The bulk of this stone came from the Indicator and the Black Seam country.

In 1896 stoping was still being carried on at and above the 390-ft. level. Fair ore was also obtained at the 580-ft. level. The stopes over the north drive at the 630-ft. level were exhausted. At the 700-ft. level fair quality ore was being worked in the south drive on the Pencil Mark and the Black Seam. The 770-ft. level opened during the year failed to locate anything of value. The sinking of the No. 3 shaft, which had been begun during the previous year, was continued, and early in 1896 the 390-ft. level was opened, where a cross-cut west connected with the workings from the main shaft by a rise from the 630-ft. level, and ensured a good air supply.

In 1897 the flat veins at the 390-ft. level continued to yield fair gold. Above the 630-ft. level in the rise and winze connecting with the 430-ft. level several quartz veins were worked. At the 770-ft. level ore of fair quality was obtained from the Indicator and Black Seam. The 840 ft. level was opened early in the year, and the Indicator was located and driven on north 20 feet and south 173 feet, a small vein being followed which carried nice gold. No. 3 shaft reached a depth of 530 feet by the end of the year. Driving at the 300-ft., 400-ft. and 500-ft. levels was in progress. In the 300-ft. level west cross-cut gold-bearing stone was being worked on the 4-ft. Slate. East of the shaft some poor stone was opened up. At the 400-ft. level a cross-cut put in 360 feet east intersected some small veins. The cross-cut west at this level, which was 485 feet long, passed through several quartz formations. A rise on the 4-ft. slate was connected with the 300-ft. level. At the 500-ft. level drives were put in north and south on stone of fair quality at 125 feet west of the shaft.

In 1898 the veins above the 430-ft. level in the main shaft were small, but of fair quality. At the 630-ft. level a cross-cut was put out west to the 4-ft. Slate at 240 feet west of the Indicator. Mineralised quartz was here met with, and prospecting opened up large bodies of gold-bearing ore. Fair bodies of payable quartz were opened at the north end of the 700-ft. level on the Indicator and Pencil Mark. The 770-ft. level stopes were exhausted during the year. At the 840-ft. level the south drive was extended to 533 feet. Several rises were put up on the Indicator, and a make of stone that had been traced at various levels from the 600-ft. level of the Llanberris Company was located at 40 feet over the drive; stoping on this was begun, and good ore was won, the first crushing of 58 tons yielding 33 oz. of gold.

In 1899 the payable stone located over the 840-ft. level was followed below the level by means of winzes, some good gold being found on the Indicator. A cross-cut west off the south drive at the 630-ft. level was driven at 600 feet south of the main cross-cut out to the Western Slates, where unpayable quartz was found. The stopes at the 700-ft. level were exhausted, and early in the year this shaft (No. 2 shaft) was closed down, and all work was concentrated at the No. 3 shaft. The old main shaft was later reopened as the Llanberris No. 2 Company (see p. 229).

At No. 3 shaft a further sink of 40 feet made the total depth 722 feet by the end of the year. Prospecting at the 300-ft. level in the eastern country revealed only a small vein with little gold. Stoping on veins was carried out at the 400-ft. level. At the 500-ft. level the stopes on the Western Slates provided ore of fair quality, but patchy at times. At 292 feet west of the shaft in the 600-ft. level a payable vein was found, and driving north and rising proved good ore. On the "angle slip" break a drive was being pushed northerly to locate the Indicator, while southwards a drive was within 200 feet of the New Normanby boundary, where payable ore was left. At the 700-ft. level stoping on low-grade veins was in progress. During the year the No. 3 shaft was connected to No. 1 shaft by a tramway where power haulage was utilized.

In 1900 the southern workings were connected with the New Normanby workings at the 600-ft. level, and large bodies of ore, which at times carried fair values, became available. At the 700-ft. level only low-grade ore was found, and a drive was put in south along the Eastern Indicator country to get below the workings of the New Normanby boundary. At the 600-ft. level veins

on the Indicator were stoped north of the influence of the angle slip. At the 400-ft. level a flat vein, yielding 15 dwt. of gold per ton, was driven on, and a rise was put through to the 300-ft. level; in the north drive the stone was poor. At the 300-ft. level the quartz was poor; the west cross-cut and a south drive were cleaned out to reach a block of quartz reputed to occur around the old Sovereign shaft, but on reaching the shaft it was found to have been taken out.

In 1901 driving and stoping on the New Normanby indicator was carried out at the 300-ft. level. Very little work was done at the 400-ft., 500-ft., and 570-ft. levels. At the south end of the 600-ft. level a rise was put up 208 feet; at this height a cross-cut east intersected an auriferous vein on the Indicator, and this was worked north to the cross-course. Near the shaft, at the main 600-ft. level, gold-bearing quartz was intersected near the shaft, while in the north end veins were proved below the level by a winze. Stoping over the north level was in progress on fairly good stone, but the amount available was small.

In 1902 the No. 3 shaft and portion of the lease was taken over by the North Normanby Company, which entered into possession and worked the ground (see p. 234).

The following yields were recorded from the Speedwell mine (Nos. 1, 2, and 3 shafts):—

| Year. | Ore Crushed. | Gold Yield. | Depth. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | ft. ft. |
| 1880 .. .. | 2,680 | 471 10 16 | 160-220 |
| 1881 .. .. | 2,880 | 732 8 8 | 150-220 |
| 1882 .. .. | 7,400 | 1,625 0 0 | 200-210 |
| 1883 .. .. | 3,078 | 906 9 21 | 200-250 |
| 1884 .. .. | 3,710 | 786 15 10 | 200-254 |
| 1885 .. .. | 1,268 | 287 1 18 | 314 |
| 1886 .. .. | 3,446 | 1,601 18 18 | .. |
| 1887 .. .. | 5,830 | 1,596 5 12 | .. |
| 1888 .. .. | 2,615 | 1,025 2 12 | .. |
| 1889 .. .. | 4,661 | 2,041 10 10 | .. |
| 1890 .. .. | 4,939 | 2,667 15 12 | .. |
| 1891 .. .. | 6,905 | 2,454 2 8 | .. |
| 1892 .. .. | 13,006 | 5,156 9 0 | .. |
| 1893 .. .. | 11,886 | 4,673 12 0 | .. |
| 1894 .. .. | 14,725 | 4,923 11 0 | .. |
| 1895 .. .. | 12,066 | 6,141 17 16 | .. |
| 1896 .. .. | 10,253 | 4,424 16 0 | .. |
| 1897 .. .. | 9,345 | 3,760 9 0 | .. |
| 1898 .. .. | 8,999 | 3,250 0 3 | .. |
| 1899 .. .. | 15,395 | 4,244 12 0 | .. |
| 1900 .. .. | 8,405 | 2,023 11 0 | .. |
| 1901 .. .. | 4,177 | 9,651 0 0 | .. |

No. 3 shaft became the property of the North Normanby Company in 1902 (see p. 230). See also Llanberris No. 2 (p. 229).

SULIEMAN PASHA COMPANY.

*No. 1 Shaft.*

The Sulieman Pasha Company began operations in 1878, and by the end of that year had sunk its shaft to a depth of 250 feet. At 180 feet from the surface a drive was put out through the old gutter workings, and some fair wash was located. During 1879 the shaft was deepened, quartz worth 2 dwt. to the ton being passed through in sinking. A drive put along this stone proved ore yielding up to 4 dwt. of gold per ton, and the mine was let on tribute. The tribute party, during the last six months of the year, drove and rose 845 feet, and crushed 465 tons for a return of 78 oz. 7 dwt. 18 gr. of gold; a flat vein, yielding 8 dwt. to the ton, was worked at this time. Throughout 1880 the chief operations were at the 300-ft. level, where flat veins were prospected and stoped, the quartz averaging over 6 dwt. to the ton.

By the end of 1880, the shaft was 371 feet deep, and a drive of 88 feet on the course of the lode at this level produced 79 tons of quartz, yielding 23 oz. 2 dwt. of gold. Prospecting at this level was pushed on, and quartz of good quality was mined as far as a slide, which caused a falling off in the output. The shaft was deepened to 440 feet early in 1882. At the 440-ft. level a cross-cut intersected the lode at 67 feet from the shaft, and a drive was put in for 390 feet along the lode; a large quantity of gold-bearing ore was opened up, and the drive was let on tribute towards the end of 1882. Prospecting at this date in the 300-ft. and 370-ft. levels was in progress. The tribute party continued at work until the yields became poor at the end of 1884, and then ceased operations. Shortly after this the company located a larger make of quartz, 381 tons of which yielded 207 oz. of gold, and this continued good during 1885. At No. 1 level a tribute party obtained fair gold from what was known as the Black Mundic line of slate at 180 feet from the shaft. This was worked with good results until September, when the yields fell away, and the tribute was abandoned.

At No. 3 level good stone was mined both above and below the level, and was found to be pitching to the south and improving in quality; this led to the sinking of No. 2 shaft. A large lode was worked from a winze sunk below the southern end of the 371-ft. level. The average value of the stone crushed during 1886 was over ½ oz. to the ton; most of this ore came from workings below the 371-ft. level, where work was also carried on with success during 1887. A new formation was located in June, 1887, and proved to be 9 ft. wide in the southern portion of the mine at the 371-ft. level; drives and stopes proved a very extensive body of payable ore, and during the last half-year 8,376 tons yielded 5,747 oz. of gold.

In 1888 the average value of the ore decreased, but 11,000 tons crushed averaged over 7 dwt. of gold to the ton. In August, 1888, the workings from the No. 1 shaft were connected with those from No. 2 shaft. The tributers continued operations at the 370-ft. and 440-ft. levels with moderate success throughout 1889 and until July, 1890, when No. 1 shaft was abandoned and work was confined to the No. 2 shaft.

In February, 1891, the No. 1 shaft was let on tribute. It was deepened from 440 feet to 496 feet, and a cross-cut was opened out for the lode; only moderate success attended operations north and south of the shaft during 1891 or 1892, when blocks in the upper levels were also let on tribute, but nothing of importance was located until work ceased in 1895.

*No. 2 Shaft.*

The site for No. 2 shaft on the eastern side of Main-street to the south of Humffray-street was decided on early in 1885, and shaft sinking proceeded, the working of rich stone at No. 3 level, in the No. 1 shaft, being an incentive. This shaft was 1,250 feet south and 95 feet west of the No. 1 shaft. During 1886 a depth of 393 feet was reached. In 1887 several flat veins were found at about 500 feet from the surface. At a depth of 558 feet a cross-cut intersected the lode at 90 feet east of the shaft. At this point a large body of highly-mineralized quartz was exposed, and payable ore was obtained by driving and stoping; for the first half-year 3,087 tons yielded 955 oz. 16 dwt. of gold. This average was not maintained, for in October, 1888, stoping ceased, and drives were put in north and south; this work

opened up a wide, poor lode for 420 feet, and then for a time operations ceased.

In March, 1889, tribute blocks were let both to the north and to the south of the shaft; flat veins showing gold, but irregular in quality, were located, and the main drive was put in north to get below the workings of the No. 1 shaft. Tribute parties continued operations with varying success throughout 1890 and 1891 at and above this level.

The 427-ft. level was opened in 1889 and connected with the winze workings at 440 feet below the surface of No. 1 shaft, affording an easier means for the working of the large bodies of quartz there. The tribute parties worked throughout 1890 and 1891, treating large tonnages with fair success. In September, 1891, shaft sinking was resumed, and the 630-ft. level was opened early in 1892; the lode was cut, and the level was then let on tribute. At this date five tribute parties were engaged in the mine, the whole of the workings being on tribute. Towards the end of 1892 the shaft was deepened, and a level was opened west at 700 feet to intersect the lode, which proved large but poor. In 1893 further sinking was carried out, and a level was opened at 780 feet. Throughout 1893 the tribute parties maintained a large output, which averaged over 6 dwt. of gold to the ton. In 1894 the tribute party, at the 700-ft. level, found a large body of payable quartz west of that previously driven on at this depth, and shortly afterwards payable stone was located west of the main lode. The north drive was continued to 548 feet from the cross-cut, and cross-cuts east and west passed through the lode without result.

At the 780-ft. level cross-cutting east and west was carried out in 1894, and the west cross-cut passed through a lode of promising appearance. In 1895 and 1896 payable ore was followed south to the boundary a distance of 370 feet, but north to 564 feet from the cross-cut, although a strong lode from 25 to 30 ft. wide was driven on, nothing payable was located.

Shaft sinking was continued in 1894, and a level was opened at a depth of 850 feet; a cross-cut west intersected the lode, and a south intermediate drive for 376 feet passed through strong bodies of quartz, on which several rises were put up without meeting the shoot of stone worked in the 780-ft. level.

In 1895 payable stone was located above the 780-ft. level, and stoping proceeded with good results. In 1896, at the 430-ft. level, quartz carrying from 3 dwt. to 6 dwt. of gold to the ton was located on the Western Slates; ore of this quality extended from 48 feet to nearly 200 feet north of the cross-cut. A rise from the 558-ft. level proved a body of quartz from 3 to 4 ft. wide, which yielded 3 dwt. to 5 dwt. of gold to the ton, and the block was stoped out during the year.

In 1896 driving at the 850-ft. level was continued north and south on the lode track. In the north drive, to 287 feet, the stone was promising in appearance, and a rise put up to the 780-ft. level carried quartz the whole way.

In the south drive the track continued for 230 feet, but it then gave place to a lode at 320 feet north of the cross-cut; a rise of 20 feet passed through small veins of quartz above the slide, which expanded to 5 feet of quartz of promising appearance in the next 20 feet. The north drive, at 575 feet, struck a cross-course, beyond which better country was found, and driving was continued to 686 feet.

Shaft sinking was resumed in 1897 and continued to a depth of 970 feet. At the 950-ft. level the east cross-cut was extended to 383 feet, and the west cross-cut to 245 feet by June, 1898. The records of later workings are not available.

The following yields were recorded:—

| Date. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1880 .. .. | 1,295 | 480 | 18 | 0 |
| 1881 .. .. | 5,870 | 2,274 | 11 | 0 |
| 1882 .. .. | 2,990 | 667 | 11 | 17 |
| 1883 .. .. | 4,458 | 1,643 | 11 | 8 |
| 1884 .. .. | 3,754 | 1,577 | 17 | 18 |
| 1885 .. .. | 4,786 | 1,817 | 7 | 0 |
| 1886 .. .. | 3,336 | 1,939 | 0 | 4 |
| 1887 .. .. | 10,687 | 7,053 | 9 | 0 |
| 1888 .. .. | 18,639 | 5,641 | 6 | 12 |
| 1889 .. .. | 13,380 | 5,191 | 7 | 12 |
| 1890 .. .. | 12,055 | 4,624 | 2 | 11 |
| 1891 .. .. | 18,865 | 7,120 | 19 | 4 |
| 1892 .. .. | 16,345 | 5,311 | 16 | 0 |
| 1893 .. .. | 17,185 | 5,134 | 1 | 10 |
| 1894 .. .. | 11,775 | 3,699 | 15 | 2 |
| 1895 .. .. | 6,120 | 1,597 | 1 | 8 |
| 1896 .. .. | 6,399 | 2,315 | 15 | 15 |
| 1897 .. .. | 3,447 | 1,692 | 19 | 0 |

The total output to 1898 was 172,085 tons, which yielded 62,698 oz. 11 dwt. Dividends amounted to £22,050.

### SURPRISE COMPANY.

The Surprise Company, of four shareholders, was one of the early parties to mine quartz on Black Hill, on the eastern side of which it installed a 6-head battery in 1861; the claim was on the apex of the hill. In 1861 the company claimed the unique distinction of putting through the richest crushing in the district of Ballarat, a parcel of 50 tons yielding 3 oz. of gold to the ton.

The following yields were recorded in 1861:—

| Ore Crushed. | Gold per ton. | | | Depth. |
|---|---|---|---|---|
| tons. | oz. | dwt. | gr. | feet |
| 480 | 0 | 8 | 12 | 60 to 90 |
| 520 | 0 | 2 | 6 | .. |
| 400 | 0 | 10 | 0 | 60 |
| 320 | 0 | 8 | 0 | 65 |
| 9 | 2 | 0 | 0 | 105 |

### TOWNSHIP REEF COMPANY.

The Township quartz reef, at the north-east corner of Sturt and Raglan streets, was discovered in 1854 or 1855, but, though it was tested, little systematic work was done till 1859, when some ore crushed at the Black Hill Company's battery yielded from 14 dwt. to 16 dwt. to the ton; this induced the Township Reef Company to erect a battery of 12 heads. In August, 1859, the company had two shafts, one 75 feet and the other 112 feet deep. The reef was from 5 ft. to 6 ft. wide, and pitched south. A run of alluvial from the northern end of the vein, near Mair-street, to the Inkerman lead proved to be highly payable, two companies with steam plants paying dividends up to £28 per man per week. The battery began to crush quartz from the reef in December, 1859, and dealt with 180 tons a week. The battery sand was used to fill the stopes. The plant cost £2,300, exclusive of the labour of 20 shareholders.

The gold in the reef was coarse, and 70 per cent. of it was caught in the boxes. In May, 1860, a new shaft was sunk to a depth of 150 feet, but as no quartz was discovered, another shaft was started to the south-west (Fig. 28).

In December, 1860, the company was re-organized as the New Township Reef Company, and shortly afterwards some quartz was located, but it proved to be unpayable, and the mine lay idle for a time.

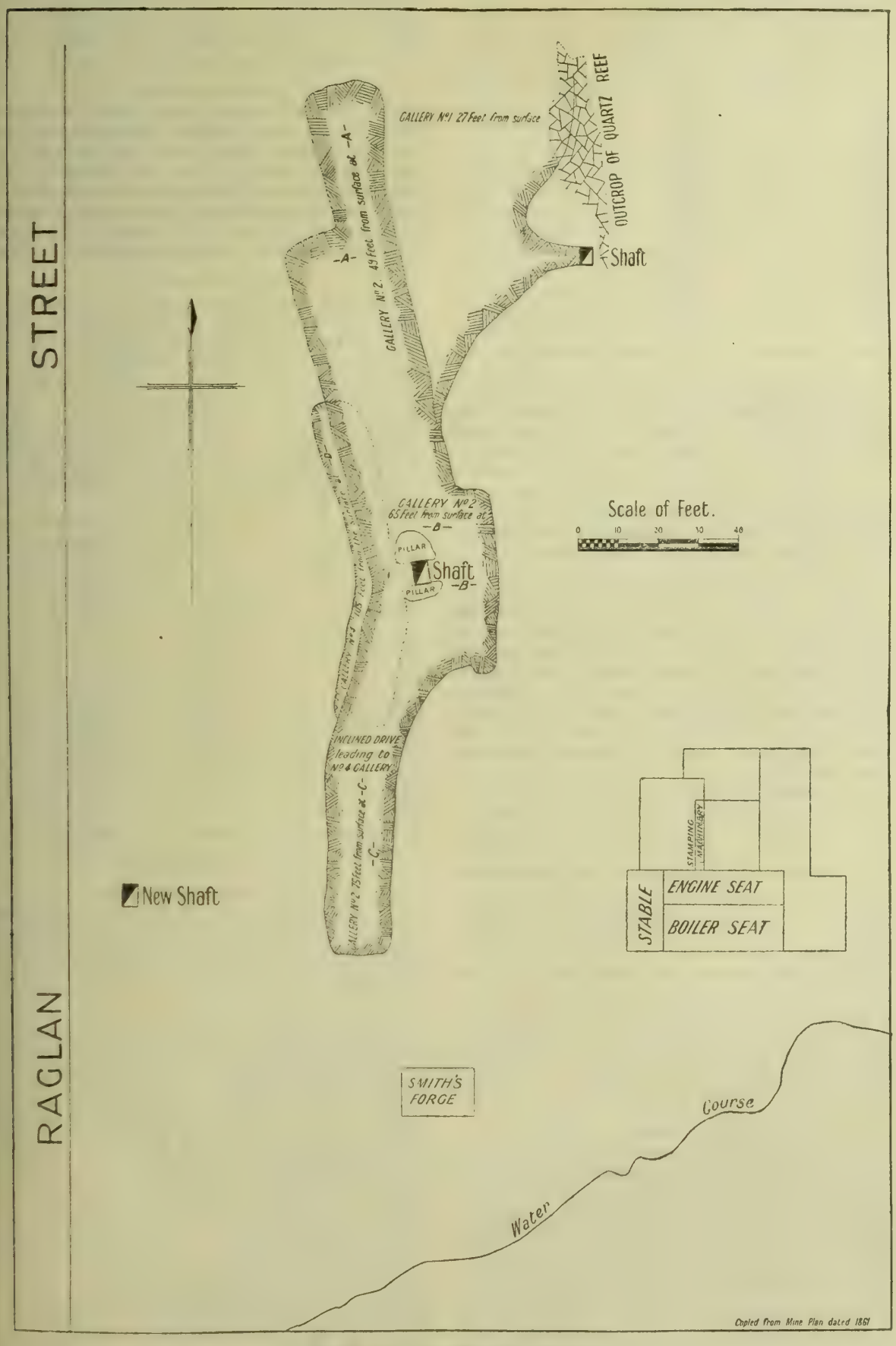



Fig 28. Plan, Township Mine, Ballarat.

### TINWORTH'S MINE.

This mine, which was privately owned, adjoined the Woah Hawp Canton. Indicator veins were worked to a depth of 635 feet, and are reported to have been very rich. In 1910 the property was purchased by the Woah Hawp Canton Company. The published yields are—

| Year. | Ore Crushed. | Gold Won. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1895 .. .. | 741 | 109 | 0 | 0 |
| 1896 .. .. | 1,990 | 1,0 2 | 3 | 0 |
| 1897 .. .. | 2,584 | 1,629 | 4 | 0 |
| 1898 .. .. | 2,408 | 1,065 | 1 | 0 |
| 1899 .. .. | 1,905 | 695 | 15 | 0 |
| 1900 .. .. | 2,010 | 758 | 0 | 0 |
| 1901 .. .. | 2,070 | 756 | 6 | 0 |
| 1902 .. .. | 1,990 | 824 | 6 | 0 |
| 1903 .. .. | 1,260 | 352 | 16 | 0 |
| 1904 .. .. | 850 | 423 | 14 | 0 |
| 1905 .. .. | 670 | 310 | 11 | 0 |
| 1906 .. .. | 1,285 | 172 | 18 | 0 |
| 1907 .. .. | 670 | 330 | 9 | 0 |
| 1908 .. .. | 425 | 298 | 4 | 0 |
| 1909 .. .. | 205 | 129 | 12 | 0 |

### TOWNSHIP REEF GROUP OF MINES.

The Hurdsfield "rush" and the success of the Band and Albion Company led to the opening up of the old Township line of reef in the vicinity of Sturt-street and to the north in 1880. A number of companies were formed, but, although a few spurs carrying gold were located, nothing permanent was discovered. Among the companies at work the following may be referred to:—

#### 1. COLLIS WASHINGTON COMPANY.

This company occupied a site on the north side of Sturt-street. At a depth of 240 feet the lode, which was 2 ft. wide, was cut at 53 feet from the shaft, and was driven on north for 42 feet and south for 43 feet; a crushing of 95 tons gave a return of nearly 12 dwt. to the ton. At the 140-ft. level a rise of 24 feet cut flat auriferous veins from 2 in. to 6 in. wide. In August, 1881, work was suspended.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | Depth. |
|---|---|---|---|---|
| | tons. | oz. | dwt. | feet |
| 1880 .. .. | 230 | 81 | 5 | 240 to 250 |
| 1881 .. .. | 1,056 | 413 | 14 | 140 to 150 |

#### 2. MARSHALL'S FREEHOLD COMPANY.

Marshall's Freehold Company, adjoining the Collis Washington, sank its shaft in 1880 to a depth of 300 feet, in the hope of meeting the same run of veins, but was unsuccessful.

#### 3. LYONS-STREET FREEHOLD COMPANY.

The Lyons-street Freehold Company held four freehold allotments in Lyons-street north at a site formerly known as the old quarry-hole. Operations began in February, 1880, and the shaft was sunk to 157 feet. At 145 feet a cross-cut east intersected a spur at 25 feet from the shaft, and a drive was put in 53 feet south along the spur. A rise over the level and short cross-cuts failed to prove any quartz. A cross-cut driven to the western boundary of the claim intersected a formation 4 ft. 6 in. wide, which was supposed to be identical with a formation in the old quarry-hole, but a drive south along the footwall to the south boundary failed to locate any payable ore.

#### 4. NEW MAIR-STREET COMPANY.

The New Mair-street Company, in 1880, sank a shaft and opened out at a depth of 80 feet, where a spur 2 ft. wide was cut at 8 feet west of the shaft. A trial crushing of 40 tons yielded 10 oz. 18 dwt. 12 gr. of gold.

### TRIUNE COMPANY.

The Triune Company was formed in August, 1861, by the amalgamation of the Jenny Lind and two smaller claims, south of the New Perseverance Company, White Horse Ranges. The company consisted of 80 shareholders, 60 of whom had expended £6,000 in all in the original claims. A battery of 16 heads was erected, and preparations were made for sinking a large shaft in 1861.

### TWO TON COMPANY.

The Two Ton Company, of five shareholders, erected a 4-head battery in Two Ton gully, Black Hill, in 1864. For a considerable time the mill was occupied in crushing tailings from the puddling machines, about 8 tons being treated every 24 hours. The average yield for a time was about 6 dwt. of gold to the ton, but the mine was chiefly noted for the remarkably poor quartz, which it was found worth while to crush, as may be gathered from the following published returns:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | | oz. | dwt. | gr. |
| 1864 .. .. | 14,760 trucks | 437 | 3 | 6 |
| | tons. | | | |
| 1865 (3 quarters) | 5,000 | 250 | 0 | 0 |
| 1866 (3 quarters) | 5,350 | 261 | 0 | 0 |
| 1867 .. .. | 5,200 | 437 | 12 | 0 |
| 1868 .. .. | 3,252 | 262 | 0 | 0 |
| 1869 .. .. | 610 | 75 | 0 | 0 |
| 1870 .. .. | 160 | 30 | 0 | 0 |
| 1871 .. .. | 1,900 | 459 | 10 | 0 |
| 1872 .. .. | 1,620 | 162 | 0 | 0 |
| 1873 .. .. | 1,630 | 266 | 5 | 5 |
| 1874 .. .. | 920 | 167 | 15 | 0 |
| 1875 .. .. | 660 | 112 | 0 | 0 |
| 1876 .. .. | .. | .. | | |
| 1877 .. .. | 845 | 146 | 0 | 0 |

### TREDENNICK AND PARTY.

Tredennick and party erected a battery of 16 stampers on the west side of the Old Post Office reef in 1860, and crushed from a small claim, as well as for the public, for many years.

### UNITED BLACK HILL COMPANY.

The United Black Hill Company was formed in September, 1875, by the amalgamation of the Railway Reserve, the Black Hill South, and portion of the Black Hill claims. The area was held on tribute by a party of 80 shareholders for a term of eight years. A shaft of the Black Hill Company was deepened from 400 feet to 460 feet early in 1876, and the 480-ft. level was opened. Several nuggets were found on the Indicator. The gold yield for the first half of the year 1876 was 1,350 oz. 13 dwt. from 2,513 tons of ore crushed. In 1877 a large quantity of ore was opened up at the 400-ft. level, and dividends were paid. Operations during the first half of 1878 were unprofitable, but in June a vein was struck on the Indicator at the 450-ft. level, which yielded several nuggets. Shaft-sinking was resumed, and the 510-ft.

level was opened in July, 1878. In 1880 a long cross-cut west was put out for the Sulieman line of lode, and a quartz spur 1 ft. 2 in. thick, showing gold freely, was worked to the north and south boundaries of the claim. During 1880 and 1881 £4,000 was paid in dividends. Towards the end of 1880 a run of veins on the New Mundic Slate, at a depth of 450 feet, yielded between 200 oz. and 300 oz. of nuggets. In 1881 the shaft was sunk to a depth of 600 feet, and a cross-cut at the 580-ft. level was opened west. At the 510-ft. level a cross-cut east was put out 478 feet: the veins on the indicator at this depth were small, and the block to the 450-ft. level was let to a party of sub-tributers. In 1883 the cross-cut west, at the 580-ft. level, was 742 feet long, and had to be abandoned on account of the flooding of the mine; the east cross-cut at this depth was 403 feet long.

The following yields were recorded:—

| Year | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1875 .. .. | 1,764 | 627 | 3 | 6 |
| 1876 .. .. | 6,491 | 2,462 | 2 | 0 |
| 1877 .. .. | 6,012 | 2,609 | 11 | 6 |
| 1878 .. .. | 2,827 | 1,258 | 7 | 19 |
| 1879 (half-year) | 556 | 365 | 1 | 10 |
| 1880 (3 quarters) | 2,249 | 1,547 | 14 | 6 |
| 1881 .. .. | 4,865 | 1,731 | 6 | 0 |
| 1882 .. .. | 2,627 | 1,069 | 11 | 12 |
| 1883 (half-year).. | 225 | 57 | 2 | 0 |
| 1884 (3 quarters) | 557 | 202 | 3 | 11 |
| 1885 (3 quarters) | 378 | 169 | 4 | 17 |
| 1886 .. .. | 772 | 278 | 14 | 15 |
| 1887 (3 quarters) | 472 | 179 | 9 | 12 |

### WASHINGTON COMPANY.

The Washington Company was formed in August, 1879. Operations began on a small freehold allotment on the east side of Skipton-street. Early in 1880 rich stone, 10 ft. wide, was cut at 33 feet west from the shaft at No. 1 level; the first 400 tons crushed averaged over 2 oz. of gold to the ton, and for the half-year ending August, 1880, crushings of 3,129 tons yielded 4,104 oz. The drive along the rich stone at the No. 1 level was continued to the south boundary. A cross-cut west of the shaft intersected the Western lode, a large body of payable ore, at 79 feet; a rise was put up on this lode for a height of 60 feet in payable ore, on which stoping was carried out during 1880 and 1881. At No. 1 level a drive was put in north on the Western reef to the northern boundary; near the boundary a cross-cut revealed some very rich quartz at 70 feet, and ore of good quality was proved by a winze to extend downwards for 25 feet. During 1880 shaft-sinking was resumed, and No. 2 level was opened out in May; cross-cuts at this level failed to disclose any quartz, but rises were put up and connected with the formations at the No. 1 level. By the end of 1880 the mine was yielding large dividends. The stopes on the Eastern lode extended 45 feet above the No. 1 level, and stoping on this lode was continued throughout 1881, and a new level was opened above the No. 1. In 1882 the No. 3 level, and in 1883 the No. 4 level, were opened out, but failed to locate any body of quartz which could be profitably worked. In August, 1883, all the payable ore was exhausted, and the mine was closed down.

The following are the yields:—

| Year | Ore Crushed. | Gold Yield. | | | Dividends. |
|---|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. | £ |
| 1880 .. .. | 6,924 | 7,938 | 3 | 0 | 15,900 |
| 1881 .. .. | 6,644 | 4,667 | 4 | 0 | 5,700 |
| 1882 .. .. | 6,375 | 3,234 | 17 | 0 | 3,000 |
| 1883 .. .. | 6,670 | 2,458 | 16 | 18 | 4,025 |
| 1884 .. .. | 5,566 | 1,226 | 7 | 16 | .. |
| 1885 .. .. | 1,454 | 360 | 15 | 20 | .. |
| 1886 (9 months) .. | 1,641 | 303 | 19 | 2 | .. |

### WELCOME NUGGET COMPANY.

With a view of locating the source of the famous Welcome nugget, the Welcome Nugget Quartz Mining Company began operations early in 1860 on a claim north of and adjoining the Danish Company's claim, and extending to the Black Hill Flat. The first shaft was sunk near the site where the nugget was found. Prior to locating any quartz, a 12-head battery was erected. Several shafts were sunk between the church reserve and the foot of Black Hill. The company was singularly unfortunate, for, up to the time of closing down the mine, the shareholders had expended over £5,000 (after making allowance for proceeds of sale of plant, &c.), and had only won 15 dwt. of gold in three years.

### WELLINGTONIA GIGANTEA COMPANY.

The Wellingtonia Gigantea Company (48 shareholders) was formed in 1860, for the purpose of testing the quartz reefs south of the Black Hill Company's shaft. The first shaft was sunk near Humffray-street, and several shallower prospecting shafts were put down in the vicinity. Numerous quartz veins were met with, and a parcel of 26 tons yielded 10 dwt. to the ton, as well as a great number of specimens. A crushing plant of 16 stamps was in working order by the end of 1860. By this time three lodes from 7 feet to 14 feet wide were proved in the claim. Quartz was followed to a depth of 120 feet in the main shaft. Towards the end of 1861 some very rich quartz was found, some of the specimens containing over a pound weight of gold. Nine days' crushing in November, 1861, yielded 175 oz. of gold from about 300 tons; the bulk of this quartz was won at the 250-ft. level, but the richest ore was mined at the 110-ft. level from a lode the upper part of which yielded rich specimens when the cellar was being made at Spannake's Union Hotel. Before the first return from the battery, the expenses totalled £7,000. The gold yield to the end of 1861—750 oz.—was sold for £2,989. In 1862 the lode at the 257-ft. level was proved for a width of 25 feet; it was here much broken and spurry. A crushing of 100 tons was poor, and early in 1863 the mine was let on tribute for a period of twelve months.

The tributers left the main shaft and sank a new one at the south end of the mine, but they did not succeed in finding payable quartz. In March they tried the lode at the 257-ft. level in the main shaft. The quartz crushed, however, yielded only a shade over 2 dwt. of gold to the ton. The total gold yield to the end of September, 1862, was 1,918 oz., value £7,562, but only £720 was paid in dividends. The tributers crushed 1,930 tons for 231 oz. during January, February, and March, 1863.

In 1862 crystal gold was recognised in this mine. A nugget, unmixed with quartz, and

weighing 2 oz. 11 dwt., was taken from a vein at this date, and was regarded as the largest lump of pure gold found in the matrix to that time.

WILSON'S FREEHOLD COMPANY.

Wilson's Freehold Company's shaft was sunk to a depth of 420 feet by June, 1881. At this depth the vertical lode was cut at 48 feet west of the shaft; a drive was put in 235 feet on its course, and the stopes showed fair gold. Over the No. 2 level, a series of flat bodies up to 10 feet wide was worked. These extended east from the vertical lode to the boundary of the claim. Above the No. 1 level (300 feet), stopes on the vertical lode reached a height of 40 feet; the lode above this was broken and too poor to work. The shaft was sunk to 500 feet by the end of the year, and at that depth a cross-cut was put out west for 97 feet. During 1881, 17,369 tons of quartz yielded 3,493 oz. of gold.

In 1882 mining operations were not successful, as the lode at the 500-ft. level was broken and poor throughout, and in March the mine was let on tribute. Prior to this, 3,359 tons crushed yielded 575 oz. of gold, but the stone mined by the tributers was poor; most of the ore was won from the stopes above the Nos. 1 and 2 levels. In 1882 the tributers crushed 6,630 tons of quartz for 1,134 oz. of gold.

In 1883 a new level was opened out from the shaft at a depth of 200 feet, but no payable quartz was found. Another level was opened on quartz at a depth of 256 feet, but this also was poor. A small block of richer ore was cut at 100 feet north of the shaft at the No. 2 level, and yielded from 6 dwt. to 7 dwt. of gold to the ton. The tributers' yield for 1883 amounted to 1,014 oz. of gold from 6,408 tons of stone.

The following yields were recorded from 1880:—

| Year. | Ore Crushed. | Gold Yield. | Dividends. |
|---|---|---|---|
| | tons. | oz. dwt. gr. | £ |
| 1880 .. .. | 15,526 | 3,137 7 14 | .. |
| 1881 .. .. | 17,654 | 4,095 8 15 | 2,300 |
| 1882 .. .. | 9,127 | 1,587 8 10 | .. |
| 1883 .. .. | 6,325 | 1,013 17 15 | .. |
| 1886 .. .. | 170 | 24 14 8 | .. |

YORKSHIRE REEF (LIVINGSTONE) COMPANY.

The Yorkshire reef was prospected during 1859. A trial crushing from a reef 3 feet wide was put through the Black Hill Company's battery, and yielded 25 dwt. to the ton. At a foot below the surface the prospectors found a broken or rubbly spur 9 in. wide, which yielded a quarter of an ounce of gold to the tub, and caused a line of claims to be taken up north and south. Much of the surface material adjoining the reef was puddled during 1860. Meanwhile the Yorkshire Reef Company sank its main shaft to a depth of 120 feet, and, re-forming as the Livingstone Company, erected a battery of eight heads early in 1861 at a cost of £1,500. This battery was similar to that erected at the Wellingtonia Gigantea Company, and was constructed with cast iron frames. The results of crushing were never recorded.

YOUNG BAND EXTENDED COMPANY.

The Young Band Extended Company was formed in 1880, and by February, 1881, the shaft was 498 feet deep. At the 481-ft. level a cross-cut was put in east for 236 feet; at 200 feet this intersected a formation (Finn's reef) 25 feet wide in disturbed country. At 18 feet south from the shaft a drive south proved only small leaders for 308 feet; cross-cuts east and west from the drive proved nothing of value until October, 1881, when a body of rich quartz underlying west was cut. A drive along this stone connected with the Band and Albion workings. The portion of this body of ore within the claim was 220 feet long and 6 inches to 40 feet wide. In the first half-year it yielded 3,448 oz. of gold from 2,866 tons of quartz crushed, and in the half-year ending February, 1883, 733 oz. from 493 tons. By the end of 1882, when the stopes were becoming exhausted, dividends amounted to 4s. per share. Throughout 1883 prospecting, carried out at the 280-ft., 380-ft., and 480-ft. levels, proved nothing but poor ore, the return for the year being 59 oz. 3 dwt. from 300 tons.

The following yields were obtained:—

| Year. | Ore Crushed. | Gold Yield. |
|---|---|---|
| | tons. | oz. dwt. gr. |
| 1881 .. .. | 2,299 | 1,911 13 20 |
| 1882 .. .. | 2,909 | 6,711 3 12 |
| 1883 .. .. | 300 | 59 3 0 |

YOUNG BAND AND ALBION COMPANY.

The Young Band and Albion Company was formed in 1879. By the end of the year its No. 1 shaft was 375 feet deep, and its No. 2 shaft 90 feet deep. Throughout 1880 prospecting was carried out, while the shaft was deepened to 500 feet, and a run of rich ore was struck at a depth of 470 feet in the south end of the mine. Dividends amounting to 9s. per share were paid—to this date 4s. 9d. per share had been called up. During 1881 the shaft was sunk to 700 feet, and levels were driven at 516 feet, 616 feet, and 700 feet. The 516-ft. level was connected, near the south-east corner of the lease, with the North Band and Albion Company's workings, and a drive was then put in north for 100 feet, but it failed to locate any quartz. The 616-ft. level, at 120 feet east of the shaft, passed through several gold-bearing leaders in mineralized slates dipping easterly. Below the 516-ft. level the shaft cut a nearly vertical lode 3 feet wide, which passed out of the shaft to the east at 70 feet below the 516-ft. level; it contained a little fine gold.

Regular crushings were kept up during 1881 and 1882, and a large quantity of poor quartz was opened up near the south boundary in the latter year. At the 470-ft. level a shoot of quartz 80 feet long, and carrying from 6 dwt. to 9 dwt. of gold to the ton, was worked. The No. 2 shaft, near the creek, was sunk to a depth of 300 feet, but little further work was carried out by the company at this shaft.

The following yields were recorded from 1880:—

| Year. | Ore Crushed. | Gold Yield. | Dividends. | Depth. |
|---|---|---|---|---|
| | tons. | oz. dwt. gr. | £ | feet. |
| 1880 .. | 4,200 | 2,201 15 18 | 1,880 | 470 |
| 1881 .. | 2,705 | 1,199 1 1 | .. | .. |
| 1882 .. | 3,441 | 995 3 8 | .. | 400 to 600 |

YOUNG WASHINGTON FREEHOLD COMPANY.

The Young Washington Freehold Company, formed in 1880, was one of the short-lived ventures of the boom. A shaft was sunk 335 feet, with levels at 200 feet and 335 feet, but nothing of value was located, although several leaders were cut, and in September, 1881, the company suspended operations.

## RECENT OR EXISTING QUARTZ MINING COMPANIES.

BALLARAT NORTH PROSPECTING COMPANY (Pl. II).

This company was formed in 1908 as a result of a movement among a few of the citizens to prospect for the northward extension of the Sebastopol reefs. At the time of commencing operations, the characters of the Sebastopol reefs had not been definitely established, and this, together with the entire absence of surface indications and the limited number of shaft sites available, rendered prospecting operations the more unsatisfactory. After an examination of the few economical sites, an old shaft originally started by the Ballarat West Company was selected, and plant erected.

Aided by a Government grant, the shaft was deepened to 330 feet, and an eastern cross-cut was started in 1909. Notwithstanding liberal State assistance, calls were not forthcoming, and after 300 feet of cross-cutting, operations ceased for a time. Shortly after renewing operations a spurry formation was intersected at 500 feet from the shaft, and an indicator or pyritic seam was found in contact with the quartz, which yielded some highly auriferous specimens. Driving north and south on this formation proved that it was a spur, which pitched underfoot going south, while to the north the indicator diverged from the quartz spur, which became poor, 209 tons of quartz yielding 91 oz.

The cross-cut east was extended to 810 feet from the shaft, meeting a small cross-course, which evidently connected with the overlying alluvial, as fire-damp was proved by an explosion shortly after cutting same. Encouraged by the striking of payable stone, and on account of the trouble of prospecting at shallow levels owing to the objections of private property-holders, the company decided to sink the shaft to 500 feet and open out at that level. It was also decided to form a separate company to explore the southern portion of the lease (see Ballarat City Company). At the 500-ft. level cross-cutting east and west was undertaken, and in the east cross-cut the mineral seam, which was found associated with the auriferous quartz in the level above, was intersected, but although quartz veins cutting this were found, no gold was met with. A rise was put up on the mineral seam and connected with the upper level, but nothing payable was located. Operations ceased during 1911.

*Structure.*

The shaft bottomed at 100 feet after passing through 95 feet of basalt. It entered the bedrock in a broad monoclinal fold, in which it continued to the 500-ft. level, where the fold appeared to be listing slightly to the west. At the 330-ft. level a main anticline occurred at 85 feet east of the shaft, followed by a main syncline at 800 feet east. In the 330-ft. level a large fault occurs at 260 feet east, and this appears to be identical with one at 70 feet east of the shaft in the 500-ft. level. This fault appears to displace the anticline about 50 feet on the top side (Pl. II.).

West of the shaft a second monocline occurs, and this, as well as the one in the shaft, lies in west-dipping beds. In the 500-ft. level a syncline occurs at 225 feet west of the shaft, followed by an anticline at 460 feet, which brings up beds identical with those exposed on the anticline to the east of the shaft. At this level a minor fold in east-dipping strata occurs at 380 feet west of the shaft in the 500-ft. level, and another at 640 feet east of the shaft in the 330-ft. level. The strata throughout consist of alternate thin beds of slate and sandstone. A number of pyritic seams occur, and are shown on the section.

BALLARAT CITY COMPANY (Pl. III.).

This company was formed in 1910 to prospect the southern portion of the Ballarat Prospecting Company's lease, following the discovery of a rich quartz spur in that mine. The shaft is situated on the northern side of Mair-street, in allotment 58, parish and city of Ballarat. The main shaft was sunk through 35 feet of basalt and 4 feet of clay before reaching the bedrock, in which a reef drive of an early-time alluvial claim was met at 45 feet. At 476 feet cross-cuts were opened east and west from the shaft. Although unsatisfactory from a commercial point of view, they gave a valuable section of that portion of the field.

*Structure.*

Very soft and broken east-dipping strata were sunk through in the shaft to a depth of 300 feet, where more solid strata were met with. In the east cross-cut, at 130 feet from the shaft, a syncline occurred with a pitch of 23° to the south, followed, at 290 feet, by a roll, also pitching south, and up to the face at 340 feet west-dipping strata were passed through.

Going west from the shaft east-dipping strata were passed through up to an anticline at 180 feet; near this point a cross-course, striking north-easterly, disturbed the strata, but a settled regular westerly dip was met with up to 660 feet, where a main syncline, pitching 22° to the south, occurred. From this point to the face, at 1,000 feet from the shaft, the dip is easterly, with the exception of a minor fold, which was passed through at 850 feet.

After correlating the folds in this mine with those in the nearest mine to the south (the Kohinoor), it appears probable that the main syncline west of the shaft, at 660 feet, is the Consols, but the pitch has changed from 3° to 5° north, where exposed in the Kohinoor mine, to 22° south in this mine. No trace of the black slate beds was disclosed in this section, the most westerly face of which intersects similar strata to that met with at 500 feet east of the Ballarat Prospecting Company's shaft, and to reach which this mine was started. Quartz is but sparingly developed in the cross-cuts, a few quartz veins and spurs being observed; also some verticals coinciding roughly with the dip of the strata. These verticals were largely chloritic and non-auriferous. At 920 feet west of the shaft quartz spurs with specks of galena were noticed, but no gold was obtained.

NEW KOHINOOR COMPANY (Pl. IV., VII.).

*Historical and General.*

The New Kohinoor Company was formed in the year 1875, taking over the property of the Kohinoor Company, which, up to that time, had confined operations to working the alluvial. Early in 1876 the shaft of the old Burra-Burra Company (see p. 81), having been cut down, work was commenced on a body of quartz 20 feet wide at the 190-ft. and 270-ft. levels, the main shaft then

being 350 feet deep. The first crushing yielded well, 1,208 oz. being obtained from 4,300 tons, but in the upper level, after stoping for a length of 200 feet on a reef formation, varying from 15 feet to 30 feet wide, the stone proved to be irregular. At the 270-ft. level, driving north on the eastern wall was carried out, and cross-cuts were put in west, in which direction the old drives of the Burra-Burra Company were found.

Early in 1877 it was reported that the lode had an easterly dip of 70°, and was payable for a width of 30 feet. Crushings for the last half-year of 1876 yielded 2,073 oz. 5 dwt. from 7,718 tons. After driving north the large quartz reef was found to narrow, so shaft-sinking was resumed, and by the end of 1877 a depth of 425 feet was reached. The lode was cut at 110 feet west of the shaft, and from a drive south at 75 feet a cross-cut west passed through 45 feet of hard quartz showing gold.

The upper levels were now worked on tribute. At the 350-ft. level a cross-course was met at 435 feet north of the shaft. This cross-course threw the lode 80 feet to the east, and on the north side of it the continuation of the lode, 4 feet wide, was driven on to 700 feet from the shaft. The 270-ft. level drive was continued north until the alluvial ground was met with, and the old drives of the British Company's mine were broken into at a point where a body of cement had been found and worked in 1875. At the 420-ft. level, 45 feet north of the cross-cut, a winze holed through from the 350-ft. level, and the quartz in it carried gold throughout. At 230 feet north the No. 2 rise was connected to an intermediate level, where drives of 130 feet north and 180 feet south were put in on a body of ore. At 370 feet in the north drive a rise to the level above was put up on a fair body of quartz, carrying only a little gold, and at 460 feet a cross-course was met. Towards the end of 1878 the south drive, at the 270-ft. level, was connected with the workings of Smith's Freehold mine.

In 1881 the company was prospecting for reef wash in the vicinity of the quartz reef, and struck the wash at 700 feet from the shaft, but the quality was poor. The lode at the 370-ft. (No. 3) level was found to be displaced 50 feet by the cross-course, and on the north side of it the stone was 35 feet to 40 feet in width and highly mineralized. Rises here proved that the lode was of poor quality. The drive was extended to 670 feet from the shaft, at which point a cross-cut and a rise were put in. To the south, the 425-ft. level broke through into the Wilson Company's workings, and several veins were stoped out. The lode, at the 420-ft. (No. 5) level, which proved to be disturbed and poor, was cut at 110 feet from the shaft. A little gold was seen in the quartz at 50 feet in the south drive, and also to within 15 feet of the back of the drive in a connecting rise at 15 feet south of the cross-cut. In the 580-ft (No. 6) level, the lode, 3 feet wide, was cut at 163 feet west of the shaft early in 1879, and was driven on to the south for a distance of 400 feet, proving a well-defined lode at times, showing a little gold in highly mineralized quartz.

In 1882 the No. 4 level north opened up a large body of payable stone. The footwall of the lode was met at 70 feet from the south drive, at the No. 5 level, 40 feet west of which a body of ore 8 feet wide was struck and driven on to the north and south. This reef showed gold, but it was not payable, although large bodies of stone were tested.

In 1883 the north end stopes, at the No. 4 level, continued to yield much stone of low-grade value. At the No. 5 level a large body of stone was prospected, but proved unpayable. At the No. 6 level driving south was continued on a lode 5 feet in width and highly mineralized, while northwards the lode was 3 feet wide. Shaft sinking was continued to a depth of 703 feet. The No. 7 level was opened at a depth of 680 feet, where a west cross-cut was put in. The tributers in the upper levels obtained a large quantity of stone, averaging over 5 dwt. to the ton. By the end of the year the yields fell away, and soon afterwards the mine closed down for a short period.

In July, 1884, a commencement was made to overhaul the machinery and pump out the water. In August sinking was resumed, the shaft then being 765 feet in depth. In 1885 the lode was cut at 300 feet from the shaft at the 910-ft. level, and drives to the north and south were put in. In the north drive the lode averaged 2 feet in width, and was highly mineralized, but broken up for a length of 200 feet.

South for 580 feet the lode averaged 1 ft. 3 in. wide, showing a well-defined western wall underlying west 2 feet in 6 feet. The stone proved poor, and work was stopped here in December, 1885, but in 1889 it was resumed.

Early in 1886 work at the lower levels was stopped, and operations were resumed at the 400-ft. level. The flat quartz veins to the east of the main lode were found to carry only a little gold up to 520 feet north of the cross-cut, and from here two cross-cuts were driven—one east 40 feet, and the other 53 feet—proving flat quartz veins of poor quality.

Cross-cutting west at the 580-ft. (No. 6) level was commenced in November, 1886, and a track was passed through at 57 feet to the west of the main lode. This cross-cut was put out to the west in order to intersect the Guiding Star lode, on which the Star of the East Company was then obtaining good results, and for which several adjacent companies were at this time prospecting. The drive north on the main Consols lode was extended from 200 feet to 270 feet on a mineralized lode 2 ft. thick, carrying no gold. The lode improved in size as driven on north, and reached a width of 6 feet before a cross-course was struck at 420 feet north. After driving 27 feet north-east on the cross-course a body of broken quartz was struck, and was followed for 50 feet, where a well-defined body of stone came in carrying a large quantity of arsenical pyrites. At 107 feet north of the cross-course a vertical vein of quartz carrying gold and galena was cut. This vein widened out to 3 feet, and continued to show gold for a length of 60 feet, up to another cross-course, beyond which the lode was again picked up. A crushing from this vein proved the stone to be of payable value, but when a rise and stope were started the quality fell away, 150 tons yielding only 30 oz. 11 dwt. of gold. In 1887, thinking that the cap of a shoot had been struck, the No. 7 north drive was extended from the face to 480 feet north of the cross-cut. In 1888 further rising and stoping on this vein yielded a small quantity of stone, which varied from 1½ dwt. to 10 dwt. to the ton.

The north drive at this level (Consols lode) was continued in country containing a number of slides and cross-courses, but no quartz was cut up to 1,026 ft. from the main cross-cut, at which point another cross-cut was opened out to the west for a distance of 111 feet. At 20 feet this cross-cut passed through a track 5 in. thick, on which a drive was put in to the north. At 32 feet

north in this drive the track was of favorable appearance.

At 104 feet in the north drive a cross-cut was opened out east, with a view to seeing if the lost lode lay in that direction, and at 95 feet a quartz vein was met with, which was followed north, and varied from 3 in. to 1 ft. wide. Work ceased in 1889, and the drive was abandoned until 1909.

In 1887 the north drive at the No. 7 level was repaired, and driving was resumed from a point 468 feet north of the cross-cut. At 568 feet from the cross-cut a cross-course was met with, which displaced the lode a distance of 50 feet to the east. The lode was 12 ft. in width, and, as driven on northerly, it was found to be highly mineralized, but no gold was seen in the quartz. From the No. 6 level a winze was sunk on the vein of auriferous quartz to a depth of 37 feet to connect with this drive. Up to 700 feet north of the cross-cut the lode was large and of a promising character, but no payable stone was proved. Work ceased in July, 1888, as the stone from the stopes above the No. 6 level and from a winze below the No. 5 level only yielded 57 oz. 9 dwt. from 285 tons. Work was now concentrated on the west cross-cut, which passed through several bodies of stone, including one 4 ft. thick, which gave out a strong flow of water at 564 feet from the shaft. At 921 feet another formation was met with, and at 1,100 feet some quartz veins carrying a little mineral, but no gold, were cut. In 1889 the Guiding Star lode, showing 2 ft. of highly mineralized quartz, with free gold, was cut at 450 feet from the shaft. Driving north on the course of the lode was then commenced, but after 50 feet had been driven a cross-course 1 ft. thick was struck. To the south the lode was driven on for 75 feet, the stone being small and not payable. To the north of the cross-course the Guiding Star lode was found to be displaced 123 feet to the north-east. A north drive for 200 feet proved a promising lode formation from 1 ft. 6 in. to 3 ft. in width, carrying mineral. About 300 feet to the north of the cross-course a short shoot of stone of good quality was found, to work which a new shaft (No. 2) was started in 1891. From 600 feet to 900 feet north the lode varied from a few inches up to 7 ft. wide, and was highly mineralized, but not payable. A winze 40 feet to the south of the shoot of gold was started from this level. To 100 feet in depth the lode in the winze varied from 2 ft. to 4 ft. in width, and was well mineralized, but showed no gold. A rise above the level also failed to locate the continuation of the shoot of gold, and driving on the main level was resumed without locating any payable stone. Above the level the No. 1 rise was continued to the cap of the lode, which was driven on for some distance without payable results. In 1894 attention was directed to working the alluvial in the vicinity.

In 1889 operations were commenced from the Sir Henry Loch mine at the 963-ft. level, and the drive along the lode was continued to 170 feet from the boundary. The lode, which yielded 319 oz. 3 dwt. 12 gr. of gold from 278 tons of stone, varied from 18 in. up to 3½ ft., but diminished to 18 in. at 216 feet. A stope of 220 feet in length was opened by June, 1890, and by the end of the year this was connected to the 910-ft. level from the main shaft, which was re-opened during 1889, and driving south was continued to connect with the stopes then being worked by this company from the 963-ft. level in the Sir Henry Loch mine. At 580 feet south of the cross-cut the lode in the face was 1 ft. 8 in. wide, but of poor value, and it continued so up to 1,000 feet, where payable stone 2 ft. wide was cut and followed for 300 feet up to the boundary of the Sir Henry Loch mine. In 1890 stoping above the 910-ft. level on the south boundary was commenced, the reef ranging from 2 ft. to 3 ft. in width. This work was continued until the stopes were exhausted in June, 1892.

In 1890 the south drive at the 680-ft. level was cleaned out and repaired up to the face at 430 feet from the cross-cut. At 720 feet south the lode opened out to 2½ ft. in width, and contained a little gold from 720 feet to 920 feet; the lode averaged 4 ft. in width, and, with the exception of a shoot of 30 feet to 40 feet of payable stone, it was of poor value. The payable stone was stoped out early in 1892, after connecting with the stopes from the 910-ft. level.

In the Sir Henry Loch mine driving at the 1,072-ft. level was commenced in 1890. The lode varied from 1 ft. 3 in. up to 4 ft. in width, and at times showed fair gold up to 200 feet from the boundary, where it became small and broken. Stoping was commenced over this drive in 1890, and was continued till the end of 1891.

Towards the end of 1890 driving north from the Sir Henry Loch Company's boundary was commenced at the 1,181-ft. level by the New Kohinoor Company, the lode showing 2 ft. of quartz, which was payable for a length of 30 feet. The stone, though poorer, was followed to 209 feet, where a connexion was made by means of a rise to the 1,072-ft. level, and in 1891 the block of stone between the rise and the boundary was stoped out, proving to be payable throughout.

In July, 1891, the 1,290-ft. level of the Sir Henry Loch mine was extended into the New Kohinoor Company's ground, and proved the lode to be small and broken for a length of 170 feet. All the payable stone in this portion of the mine was exhausted by the end of 1891, after having yielded 6,655 oz. 15 dwt. 8 gr. of gold from 17,600 tons of quartz.

In 1893 a drive was put in 265 feet from the 1,509-ft. level of the Sir Henry Loch mine on a lode which carried a little gold, but proved unpayable.

In 1894 work was commenced at the 1,620-ft. level of the Sir Henry Loch mine, and a drive was put in north into the Kohinoor claim. After about 100 feet of driving and 70 feet of rising had been done, to get above a slide, without anything payable being met with, operations ceased.

The 1,080-ft. level (main shaft) was opened in 1890, and a cross-cut west intersected the lode at 374 feet from the shaft. Driving north and south was commenced on the lode, which was 1 ft. 6 in. wide and well mineralized. Northerly the lode for 180 feet averaged 1 ft. 6 in. wide, and at 510 feet from the cross-cut it increased to 3 ft. of stone of a favorable character, but carrying no gold values. Driving was continued, and at 766 feet north a cross-course was struck which threw the lode 81 feet in a north-easterly direction. South of the cross-course the lode ranged from 1 ft. to 2 ft. 6 in. wide, but north of the cross-course the stone was small, well mineralized, and had good walls up to 920 feet from the cross-cut. The drive was extended to 1,195 feet from the cross-cut, where it was stopped about the end of 1892, on account of the smallness of the lode and the opinion raised that the true lode lay to the east. To prove this opinion, a cross-cut was put out along the cross-course for a distance of 396 feet, where a lode formation with a good hanging wall carrying about 3 in. of quartz was met with. This lode was followed north

for 167 feet, where 1 ft. of well-mineralized quartz showed in the face, when work ceased in June, 1893.

South at this level 80 feet of driving was done in 1891 on a promising lode, but nothing of value was proved; and as the drive coming north from the Sir Henry Loch direction was poor, little encouragement for further driving was forthcoming.

The shaft having been sunk to a depth of 1,293 feet by August, 1891, the 1,290-ft. level was opened, and cross-cutting west was started, but the lode was not met with until May, 1893. The lode where intersected, at a point 465 feet from the shaft, was 1 ft. 6 in. wide, having 10 in. of solid, well-mineralized quartz on the footwall side. A south drive was put in, and in 150 feet the lode improved to 3 ft. 6 in. wide, carrying 2 ft. of solid quartz highly mineralized and of promising character. The drive was continued to 356 feet south on a well-mineralized body of stone, work ceasing in June, 1894.

In 1892 a tribute party, working on the Consols line of country at the No. 4 (425-ft.) level, came upon a body of mineralized stone 2 ft. 6 in. wide, which yielded 84 oz. 19 dwt. 12 gr. of gold from 42 tons, and gave 17 tons of pyrites from this parcel. Several tribute blocks were let on this level, and dead work both to the north and to the south was carried out without result. In 1893 two rises were put up in the north end, of which the No. 1 rise passed through numerous quartz veins, some carrying a little gold, and the No. 2 rise cut a quartz vein carrying payable gold.

In 1893 a payable quartz vein was located in the south end, and 377 tons were treated for a yield of 151 oz. 1 dwt. of gold before the block of stone was exhausted. In 1894 the Band of Hope tribute block was worked by Bryant and Hocking, who crushed 139 tons from the eastern run of quartz veins for 104 oz. 3 dwt. At the No. 3 level operations were continued throughout the latter part of 1894 and the early portion of 1895, but the stone became too poor to work.

In 1894 operations in the old worked alluvial ground were commenced. The wash and cement were crushed, but only moderate success attended this work. During 1896, in the vicinity of the old Golden Point gutter, a bed of wash 4 ft. to 10 ft. in thickness was met with, but proved to be only a small block. The ground worked during the year averaged a little over 1½ oz. to the set. In 1897 the value fell to under 1 oz. to the set, and the alluvial workings were then abandoned.

Towards the end of 1896 work was commenced at the No. 9 level (838-ft.), a start being made to drive north on the Consols line of country.

While working the alluvial during 1896 and 1897 at 346-ft. (No. 3) level, several quartz veins carrying gold were located, and towards the middle of 1897 a reef drive was started on the Consols line of lode. From 500 feet to 1,100 feet the strata were disturbed, and four cross-courses were passed through, all of which threw the lode to the east. At 1,180 feet north of the shaft work ceased, as nothing defined had been met with, and the lower level then offered better inducements for prospecting.

Driving north at the 838-ft. level was commenced towards the end of 1896. In order to meet the Consols lode north of the disturbed country, the drive was started east of the shaft, and after 557 feet of driving in blank country, the No. 1 cross-course was met with. A cross-cut driven west at this point cut the lode at 50 feet. The lode where intersected had two good walls, and showed from 3 ft. to 4 ft. of mineralized stone, yielding a prospect of gold. A drive north on this lode passed through disturbed country, and at 300 feet the No. 4 cross-course was cut, beyond which a cross-cut was put in to the east in order to pick up the displaced lode. At 100 feet north of the cross-cut a rise was put up, and at 65 feet proved a lode averaging from 2 ft. to 4 ft. in width, and carrying a large quantity of mineral.

The cross-cut north of the No. 4 cross-course was extended to 78 feet without result. The north drive was then continued, and from 870 feet to 1,070 feet the country was more settled. At 1,074 feet north of the shaft a cross-cut was put in east for 166 feet, meeting a lode track with 2 ft. 6 in. of mineralized quartz, on which a north drive was put in. At 1,660 feet from the shaft another cross-course was met with, throwing the lode to the east, and a cross-cut was put in passing through disturbed country up to the track of the lode, which carried a small make of favorable looking quartz. This quartz was driven on for a total distance of 1,996 feet from the shaft, operations ceasing in 1899. The face of the drive was under the centre of Urquhart-street.

In 1906 operations at the mine were resumed, and a cross-cut was put in east from the shaft for a total distance of 670 feet. No lode tracks were met with, but a small saddle reef on an

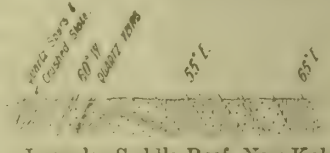



Fig. 29. Irregular Saddle Reef, New Koh-i-noor, 838-ft. level, east crosscut. Scale, 40 feet to 1 inch.

anticline was passed through at 560 feet. This work, which might have led to a development in new country, was stopped during 1907, and prospecting was carried out above the 580-ft. level in the vicinity of the Consols lode, where a rise from the main cross-cut was connected to the No. 5 level, and an intermediate drive was opened out at 40 feet. Cross-cutting and rising were carried out, chiefly in the east-dipping strata, and a connexion was made to the old Washington Company's mine. Several quartz spurs were passed through, but nothing of value was located.

In 1909, the southern workings having been abandoned, the main north drive at the No. 6 level (580 ft.), which had been stopped in 1889, was cut over and repaired to the north face. Aided by a Government grant, originally allotted for driving the eastern cross-cut at the 838-ft. level, a cross-cut east was driven from the north face a total distance of 1,132 feet before operations finally ceased in 1911.

At the date of ceasing operations the water in the Sir Henry Loch mine stood at 480 feet from the surface, practically 100 feet above the level at which operations were being carried on in this mine. During the years 1890 to 1908, the water from the Kohinoor Company's mine ran through into the Sir Henry Loch mine. Falls of earth must have restricted the flow, and enabled the Kohinoor pumps to discharge not only the incoming water, but also some from the Sir Henry Loch Company's mine. Within a fortnight of pumping ceasing the water level in both shafts was within 480 feet of the surface.

*The No. 2 Shaft.*

In April, 1891, a start was made to sink the No. 2 shaft to test the Guiding Star line of lode. A depth of 98 feet was reached in hard basalt, and then work ceased until June, 1896, when, after erecting a small plant, sinking was resumed and the shaft bottomed at a depth of 250 feet. Clay

rested on the bedrock, and no wash was met with. Some difficulty was experienced in sinking through a layer of drift and through portion of the basalt where the water was heavy, but after this had been puddled back and a larger plant erected better progress was made during 1897. At 326 feet from the surface a cross-cut east intersected a lode track (the Guiding Star) at 294 ft. from the shaft. Where met with, this lode was from 8 in. up to 1 ft. wide, with a well defined footwall. Driving north on the lode was carried on for 200 feet in broken country.

In June, 1897, the 400-ft. (No. 2) level was opened, and a cross-cut was put in east 320 feet, but no lode was located. Further shaft sinking was carried out, and in June, 1898, the 750-ft. level was opened and a cross-cut put in east. This was continued to 520 feet, where a cross-course was struck and followed along by a cross-cut. Several bunches of well mineralized stone, together with flat and vertical quartz leaders, dark indicator veins carrying a large quantity of mineral and a little gold had been met with when operations at this shaft ceased in February, 1899.

*Structure.*

The section exposed in this mine extends on either side of the Consols lode, and affords the only insight into the strata to the east of this line that was accessible at the date of the survey. West of the shaft, in the 680-ft. level, the Consols anticline occurs at 180 feet. The Consols syncline was observed at a point 565 feet west of the shaft. This was followed by regular east-dipping strata up to an anticline at 920 feet. Further west the section was closed, but from information obtained this was undoubtedly the Guiding Star anticline.

East from the Consols anticline, at 180 feet from the shaft and 360 feet from the Consols anticline, a syncline occurs. At 450 feet from the shaft there is an anticline; at 510 feet the western apex of the corrugated fold with the syncline; and the eastern anticline at 560 feet. At 620 feet there is another syncline, 60 feet to the east of which indications of another anticline were present. The pitch of these folds was 3° to 4° to the south. In the cross-cut driven east from the northern end of the 580-ft. level the strata dipped to the east from the Consols anticline for 190 feet (240 feet from the north drive). At 455 feet east of the drive an anticline followed, and at 30 feet further east a syncline with a regular west dip to a well defined anticline at 1,116 feet east of the main drive. This fold pitched south at an angle of 17°. The black slate zone was not recognisable in this cross-cut. A small laminated quartz vein was passed through at 350 feet, and a parallel one at 450 feet; these veins varied from 1 in. up to 3 in. in width.

*Quartz Occurrences.*

Details of the lode formations are included above, but a general summary of the quartz bodies worked reveal two well defined lodes—the Consols and the Guiding Star—on which hundreds of feet of driving failed to locate any golden shoots, although on the favorable dip and consisting of large bodies of laminated mineralized quartz. The cap or upper portion of the Consols lode consisted of a large quartz blow approximating to a fissured saddle. The gold contents in this lode were low, but some profitable spurs were located in the eastern dipping strata, and more especially to the south of the main shaft in the vicinity of the Washington and adjacent mines. On the Sir Henry Loch boundary a south pitching shoot of payable stone was located on the Consols line.

The following yields were obtained by the New Kohinoor Company:—

| Year. | Tons. | Yield. | | |
|---|---|---|---|---|
| | | oz. | dwt. | gr. |
| 1876 .. .. | 9,096 | 2,995 | 0 | 12 |
| 1877 .. .. | 7,997 | 2,675 | 17 | 0 |
| 1878 .. .. | 4,844 | 2,009 | 3 | 0 |
| 1879 (6 months) | 1,960 | 395 | 18 | 0 |
| 1880 .. .. | 15,613 | 5,688 | 9 | 0 |
| 1881 .. .. | 22,753 | 4,328 | 11 | 18 |
| 1882 .. .. | 31,938 | 5,236 | 11 | 0 |
| 1883 .. .. | 15,611 | 2,222 | 17 | 0 |
| 1888 .. .. | 955 | 341 | 10 | 6 |
| 1890 .. .. | 8,100 | 3,161 | 15 | 6 |
| 1891 .. .. | 9,176 | 2,371 | 18 | 0 |
| 1892 (9 months) | 553 | 75 | 9 | 12 |
| 1893 (9 months) | 1,473 | 514 | 6 | 14 |
| 1894 (9 months) | 1,868 | 846 | 13 | 5 |
| 1895 .. .. | .. | 2,546 | 17 | 10 |
| 1896 (3 months) | .. | 249 | 0 | 0 |

From 1876-1896, 43,186 oz. of gold was won. Dividends amounted to £34,900.

BAND AND LOCH UNITED COMPANY.

(Pl. V., VI., VIa., VII., VIIa.)

*Historical and General.*

This company was formed about the end of 1898, as the result of the amalgamation of the Band of Hope and Albion Consols with the Sir Henry Loch United Company.

Operations were confined to the No. 9 shaft of the Band and Albion Company, and lay in the extension of the north drive on the Consol's lode at the 1,900-ft. level, which, prior to the formation of this company, stopped at 1,021 feet from the cross-cut. By continuing the drive for 434 feet a payable shoot of stone 130 feet in length was passed through. A rise was put up to intersect the auriferous stone in the winze below the 1,730-ft. level of the Sir Henry Loch shaft. A main winze, or blind shaft, was then sunk to a depth of 180 feet below the 1,900-ft. level, making a total depth of 2,080 feet below the surface. The line of lode was intersected 47 feet to the west of the winze at this depth.

By the close of 1899 the rise to the Sir Henry Loch Company's workings was connected, and the water taken out of the Sir Henry Loch shaft, which was then repaired and served as an air-way. The 1,900-ft. level north was driven to 1,538 feet. A winze in the auriferous shoot proved that the lode averaged 2 ft. in width, and was of good quality to 100 feet.

The 2,080-ft. level, driven from the blind shaft, was extended to 250 feet on the course of the lode, but to the south the lode was broken up and of poor quality. During the half-year ending November, 1890, a profit was shown over working expenses, but calls were necessary to reduce the overdraft, which was the result of the purchase of the property. Driving and stoping on the Consols line of lode, between the 1,900-ft. and 2,080-ft. levels, were continued throughout 1900, but the results showed little profit, and these workings were then let to contractors. In May, 1901, preparations to sink the shaft below the 1,900-ft. level were made, and the sinking commenced. By May, 1902, a plat had been cut for the 2,100-ft. level, and cross-cutting west for the Guiding Star lode was started. In March, 1903, shaft-sinking was again resumed, and by November of that year a depth of 2,321 feet had been reached, and a cross-cut east had been driven 70 feet from the shaft at the 2,300-ft. level.

On the Guiding Star line, which was west of the shaft, a few trial crushings were taken out from the 1,300-ft. and 1,900-ft. levels in 1899, but these were found to be unpayable. Nothing further was then done on this belt of country until 1902, when the Guiding Star shaft of the Star of

the East Company, adjacent on the south, proved payable stone. This discovery induced the company to open out at a depth of 400 feet from the surface. The east cross-cut was repaired to 193 feet from the shaft, and a drive was put in to the south on a lode track. A mineral seam was passed through in the cross-cut at 77 feet from the shaft, but a north drive of 260 feet and a south drive of 662 feet on the lode track failed to disclose any payable stone. The south drive passed through several makes of mineralized stone, some auriferous, but none payable. From the end of the south drive a rise was put up 108 feet, and cross-cutting west in search of the mineral lode was commenced both from the top of the rise and also from the main drive at the foot of the rise. At the top of the rise the west cross-cut was put in for 40 feet in broken country, and the east cross-cut was extended to 35 feet, where a rise was put up to a height of 123 feet without meeting any payable quartz. The main west cross-cut, off the south drive, was continued to 285 feet, and passed through the same mineral tracks as those met with in the main cross-cut east of the shaft. In 1903 operations ceased at this level.

In 1904, at the 2,100-ft. level, the west cross-cut towards this line of lode reached to a distance of 740 feet from the shaft. Nothing of value was passed through, and a south drive was then commenced from a point 480 feet west of the shaft. This south drive passed through a large cross-course, and was stopped in August, 1904, no work being subsequently carried on at this level.

On the Consols lode, in 1900, the stopes between the 2,080-ft. and 1,900-ft. levels yielded a large quantity of gold-bearing stone. Above the 1,900-ft. level stoping was carried on on the Sir Henry Loch shoot, near the connecting rise, where a fair supply of payable stone was obtained. Below the 1,900-ft. level drives were opened out north and south from the winze in the Sir Henry Loch shoot of stone, and here the lode ranged from 3 ft. to 60 ft. in width, and was payable for a length of over 300 feet. Stoping above this 2,000-ft. level yielded, with blocking strips, stone for an average width of 50 ft. Above the level the reef narrowed as the 1,900-ft. level was approached. Stoping this large formation proved costly in consequence of the great width of stopes which had to be filled in with mullock to a height of 30 feet above the level, and the gold yield, as given in the list of yields, fell away.

To effect a saving in the cost of conveying the material between the blind shaft and the main shaft, at the 1,900-ft. level, which had hitherto been carried out by truckers, horses were utilized in 1900. From the foot of the blind shaft, the 2,080-ft. level carried a lode track which was followed to 670 feet. At 320 feet north of the blind shaft a cross-cut to the west passed through 35 feet of unpayable quartz. At 670 feet north a cross-cut was driven west, and cut the hanging-wall of the lode formation. A rise (No. 1) was put up near this cross-cut, and at 25 feet above the level cut a strong lode, carrying galena and blackjack, and underlying flat to the west. The cross-cut west cut the wall of the lode at 30 feet from the north drive, and on this the main level was now driven. At 800 feet from the blind shaft a full face of favorable-looking stone, showing a little gold in breaking, was exposed, and this continued for over 200 feet.

In 1901 the stopes above this level were let on contract, as the result of stoping below the 2,000-ft. level had proved unprofitable to the company. Prospecting operations disclosed stone which paid the contractors, but was of little value to the company. In places quartz spurs were followed for a distance of 100 feet from the footwall, and usually carried fair gold. The contractors continued to work the quartz spurs and lode material until March, 1906, and during their five years' period of operations they obtained 15,816 oz. 14 dwt. 14 gr. of gold, valued at £65,360 8s. 1d., out of which £30,106 14s. 5d. were paid to them as wages. After the contractors abandoned the block, wages men were put on by the company, and payable stone was obtained for about nine months, until operations ceased in February, 1907.

As well as stoping and driving, a vigorous policy of prospecting the 1,900-ft. level country was undertaken during 1906, 1907, and 1908. The 2,287-ft. level, in the vicinity of the Consols lode, proved that the lode had died out on the syncline. The north drive, for a distance of 1,580 feet, followed along a fault plane, with rarely any quartz. In 1907, at 1,460 feet north of the cross-cut, a rise was put up which connected with the 2,080-ft. level, and proved that the lode continued to a depth of 80 feet below the winze workings, but nothing of value was located, although drives north 270 feet and south 70 feet were put in at 60 feet below the top of the rise (2,080-ft. level).

At 900 feet from the main cross-cut, at the 2,287-ft. level north, another cross-cut west for 333 feet was put in, and a drive north for 180 feet on a formation at 300 feet west of the main drive. A little gold was found on this formation, but nothing of payable value. In 1908 operations at the mine ceased, the company having produced 66,020 tons for a yield of 31,837 oz. 1 dwt. of gold, valued at £131,155 1s. 3d. Total calls amounted to £83,038 19s. 8d. in a period of nine years. Over £100,000 was paid in wages and contracts but nothing was paid in dividends.

### SIR HENRY LOCH SHAFT.

(Pl. V., VII., VIIa.)

*Structure.*

The shaft was abandoned, and all the machinery removed prior to the survey, but access was obtainable from the No. 9 shaft of the Band and Albion mine by means of some rises through the stopes from the 1,900-ft. level. A survey was made of the four lower levels, which revealed the structure of the country lying under the Consols line of lode. A main anticline was noticeable to the west of the shaft, from the 1,400-ft. to the 1,730-ft. levels, with west-dipping strata up to the lode. A minor fold occurred in the 1,509-ft. and 1,620-ft. levels at 300 feet from the shaft, but its influence on the lode was not ascertainable on account of all the stopes being closed. Three west-dipping and roughly-parallel faults were noticed, and are shown on the transverse section (Pl. V.). The lode, as worked from the cap at about 650 feet from the surface, was a bedded one, but above that spurs and flat veins of quartz were stoped, but no plan of these was available.

### BAND AND LOCH OR BAND AND ALBION NO. 9 SHAFT.

(Pl. VI., VIa., VII., VIIa.)

*Structure.*

As exposed in the 1,890-ft. level, the structure of this mine comprises a main anticline (the Guiding Star) at 320 feet east from the shaft and a double syncline, the minor anticline in the centre of which is noticeable at 850 feet from the shaft in the 2,287-ft. level. At the 2,087-ft. level a well developed syncline occurred at 120 feet west of the shaft, and at the 1,790-ft. level it occurred 95 feet west of the shaft. Overthrust strata are exposed in the 1,590-ft. and 1,310-ft. levels, the syncline showing beds dipping 75° to 85° to the east throughout. At the 1,590-ft level the centre lies 95 feet to the west of the shaft, and at the 1,310-ft. level it is 145 feet

to the west. The compression at these levels at similar depths compares with that of the Star of the East, the adjoining mine to the south. A syncline, probably forming a portion of a roll or monocline, was noticed in the plat at the 988-ft. level, but it was not visible in the levels above or below. West of the syncline regular east-dipping strata were exposed to 730 feet from the shaft at the 2,287-ft. level. At the 594-ft. 8-in. level a long cross-cut west is reported to have intersected the granitic dyke which extends throughout the Sebastopol field. This level was closed by a dam, and consequently not surveyed.

The lodes as worked in this mine are the Guiding Star, for which the shaft was started, and the Consols lode, which dipped towards this shaft on account of its westerly underlie.

East of the shaft a lode, probably the Guiding Star or a closely associated formation, was worked from the 400-ft. to the 890-ft. level with payable results. This lode, which was associated with the usual black slates, had a dip to the west, and conformed to the strike and dip of the strata. It was a small lode, up to 4 ft. in width. A fault was met with 30 feet under the 890-ft. level, below which nothing defined was discovered. From the section it appears probable that the reputed fault was a syncline. At the 1,221-ft, 1,310-ft., and 1,400-ft. levels a large lode formation with a well defined footwall and several feet of highly laminated quartz thereon, was driven on to the north and south, but although highly mineralized, nothing of payable value was located. Below the 1,400-ft. level the strata are highly compressed on account of overthrust folding, and no quartz was met with in the cross-cut at this level.

At the 1,790-ft. level, 400 feet west from the shaft, a number of quartz spurs, associated with a fault, was driven on. These were auriferous in places both at this level and similarly at the 1,890-ft. level and in the underhand stopes, but the values were irregular. This formation was not in any way connected with the main Guiding Star lode.

On the Consols lode the characteristic features were visible at the 1,890-ft. level, where a drive of 1,200 feet was put in on a formation from 3 in. to several feet in width. This formation, where intersected in the cross-cut, lay close to the syncline, which, at this point, was bifurcated by a small anticline. That slipping had taken place along the footwall of the lode was evident, the eastern dipping beds sliding upwards on the western dipping ones. At about 50 feet below this level the lode pitching to the north, dies out. At the 2,287-ft. level no lode or track was cut, the lode having met the syncline above this level. A drive north was put in on the eastern side of the syncline.

Although highly faulted, pitching in the beds is comparatively rare, and especially in the western workings it is of very little importance. On the Consols line a number of small faults in connexion with a cross-course occur near the main cross-cut. The black slate series occurs associated with the Consols lode, and, when above the syncline, in the overlying beds. In that portion of the cross-cut at the 1,890-ft. level, where it is timbered on account of being in the cross-course material, the black slates are repeated. In the 890-ft. level the black slates occur, and from the 1,221-ft. to the 1,400-ft. levels they form the footwall of the Guiding Star lode, and it is highly improbable that these were one and the same lode. It appears that the lode, as worked above the 890-ft. level, would correspond with the Christmas slates, which are about 60 feet to 80 feet above the lower slate. At the 1,790-ft. level a black slate was noticed on either side of the syncline, and appeared to be the downward continuation of the slate on which the Guiding Star lode had formed in the upper levels, but, owing to overthrust folding, the point could not be settled.

*Details of Mine Workings.*

*400-ft. Level.*—On account of the rich stone worked at the shallow levels in the adjacent mine—the Star of the East—the old 400-ft. level was reopened, and driving south was commenced at 193 feet east of the shaft in the year 1902.

In the south drive for 660 feet the lode track was mineralized, but was unpayable. A cross-cut was put in to the west for a distance of 285 feet. Rising and cross-cutting above the main drive were also done, but nothing of value was met with. At 77 feet east of the main shaft the mineral track was intersected, and driven on for 260 feet without payable results, and work then ceased at this level in 1903.

*1,900-ft. Level.*—When operations were commenced by the Band and Loch Company early in 1899, the north drive at the 1,900-ft. level on the Consols line of lode was in 1,020 feet from the cross-cut. On extending this drive a shoot of payable stone 130 feet in length was passed through, and a rise was then put up and connected with a winze sunk to a depth of 100 feet below the 1,730-ft. level of the Sir Henry Loch mine. The north drive was continued to 1,538 feet from the cross-cut. As soon as the rise was connected with the Sir Henry Loch workings stoping was commenced, and a fair supply of payable stone was maintained.

At 630 feet from the cross-cut a winze was sunk to a depth of 180 feet, and the lode track was intersected at 47 feet west from the bottom. Driving north at the 2,080-ft. level was continued in a broken track for 700 feet. At 800 feet a full face of stone, showing a little gold, was met with, and continued to 1,000 feet. Stoping was commenced above this level, but the stone proved to be of poor quality. At 100 feet in the winze a level was opened, and drives were put in to the north and south. Stoping was commenced over this level, the stopes averaging 10 feet in width, with blocking strips for a width of 55 feet to 66 feet. At 320 feet north a cross-cut put in 45 feet west passed through 35 feet of poor quartz.

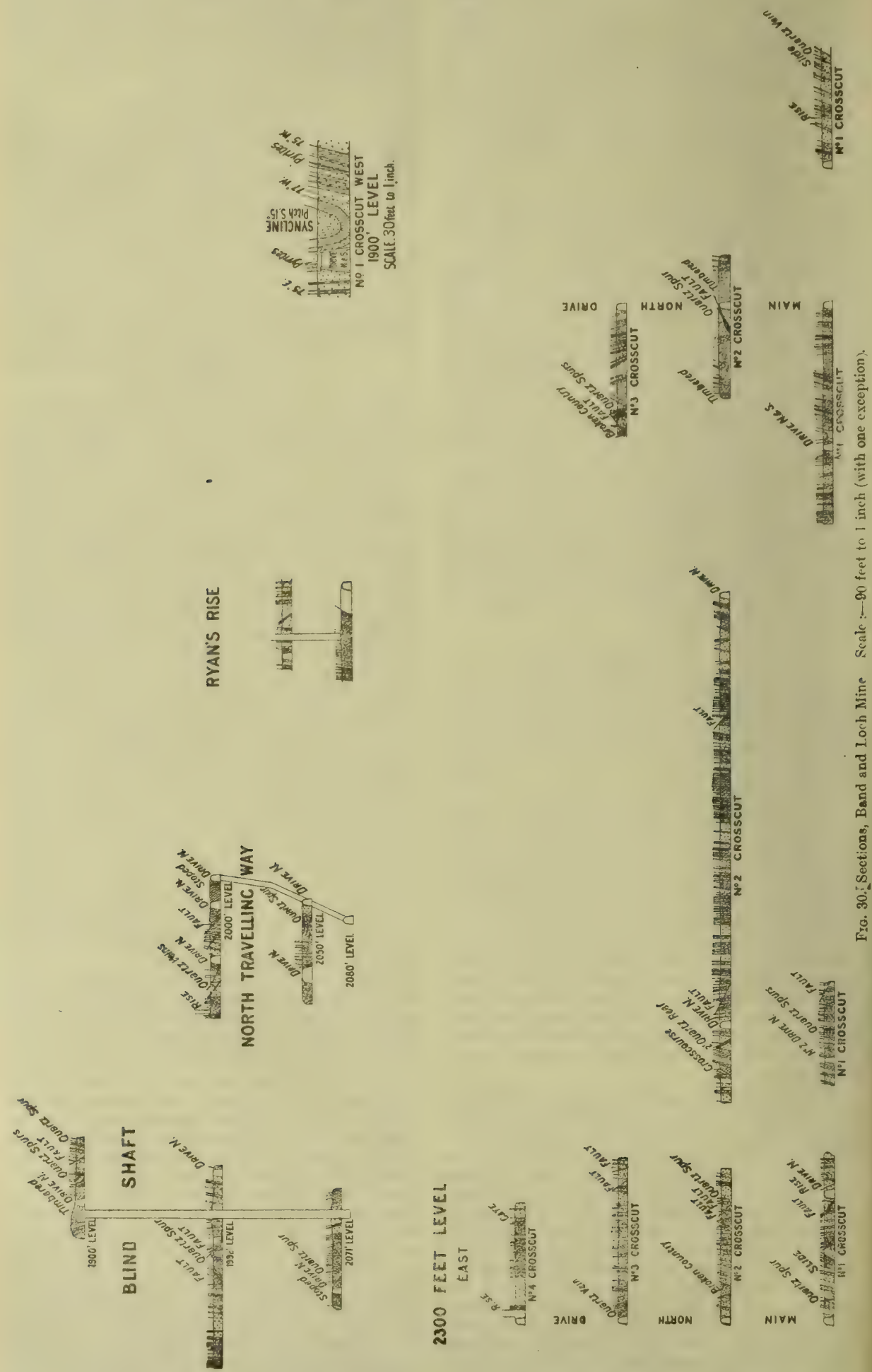
In the northern portion of the mine several levels were opened above the 2,080-ft. level, and were connected to the main drives by winzes and rises. Stoping in this neighbourhood was continued until the end of 1906.

In order to prove the country on either side of the main north drive, several cross-cuts were put in. The No. 1 east cross-cut, at 20 feet in from the main drive, intersected a lode 2 ft. wide pitching rapidly to the north. A shoot of payable stone 80 feet in length was met with in the south drive, which had been driven 130 feet.

The No. 3 cross-cut was driven east to this lode track, and a rise 32 feet in height from the No. 1 workings connected with the south workings, and the drive south beyond this point was continued. The No. 4 east cross-cut was put in 94 feet, and the No. 1 west cross-cut from 184 feet south of the blind shaft was put out to 141 feet. At 90 feet in this cross-cut 1 ft. of quartz was passed through, and on it a little driving was carried out.

*The Blind Shaft Workings.*

At 50 feet below the level a cross-cut east from the blind shaft met the lode at 32 feet, and a drive was put in 66 feet south on highly payable quartz. A rise put up on this quartz proved the lode to be 8 ft. in width. The shoot of stone as worked upwards was over 180 feet in length.


No 1 CROSSCUT WEST
1900' LEVEL
SCALE 30 feet to 1 inch.
SYNCLINE
Pitch S.15°
Pyrites
75' N.
77' W.
RYAN'S RISE
NORTH TRAVELLING WAY
2000' LEVEL
2050' LEVEL
2080' LEVEL
Quartz Lens
Rise
Drive N.
Quartz Spur
Fault
Stoped
BLIND SHAFT
1900' LEVEL
1931' LEVEL
2071' LEVEL
Timbered
Quartz Spurs
Drive N.
Quartz Spur
Fault
Fault Spur
Stoped Quartz N.
2300 FEET LEVEL
EAST
N°4 CROSSCUT
N°3 CROSSCUT
N°2 CROSSCUT
N°1 CROSSCUT
DRIVE
NORTH
MAIN
Quartz Vein
Rise
Crosscourse
Quartz Reef
Drive N.
Fault
Quartz Spurs
Broken Country
Timbered
Quartz Spur
Slide
Quartz Wall
Rise
Drive N.
Fault
Quartz Spurs
Broken Country
Timbered
Quartz Spur
Fault
Timbered
Quartz Spurs
Broken Country
Fault
Quartz Spurs
Drive N.
Fault
Quartz Spurs
Drive N.
Fault
Quartz Spurs
Drive N.

At 100 feet deep in the blind shaft a cross-cut to the east met the lode track at 28 ft., and a north drive was extended on it for a distance of 219 feet in a full face of quartz, mineralized but not payable. At 70 feet north of the cross-cut a rise was put up 30 feet to meet the shoot of stone coming down from the 1,945-ft. level, but here 50 feet of driving failed to locate payable values.

*2,100-ft. Level.*—The 2,100-ft. level cross-cut west from the main shaft was started early in 1903, and after passing through a cross-course some settled country was met with. At 540 feet from the shaft some small gold-bearing quartz veins were driven on to the south for a few feet. At 480 feet west of the shaft a drive was put in south 139 feet to the cross-course. The cross-cut was then extended to 740 feet from the shaft, where work ceased in November, 1904.

*2,300-ft. Level.*—The east cross-cut at this depth was started towards the end of 1903, and reached a total length of 850 feet early in 1905. A drive north was started at 787 feet from the shaft, and a small vein of quartz was followed without improvement in size to 2,080 feet north, where a clean footwall, with 1 ft. of laminated quartz underlying to the west, was met with. At 350 feet north of the main cross-cut a cross-cut was put in east for 108 feet, and a small make of stone was passed through. At 875 feet north of the main cross-cut the No. 2 east cross-cut was put in 100 feet. At 960 feet from the main cross-cut a cross-cut west was driven 333 feet, passing through a large make of quartz with a little gold at 300 feet, on which a rise was put up.

The drive was continued to 1,460 feet. At 1,218 feet a cross-course was passed through, which threw the lode 15 feet to the east. The north drive was stopped at 1,579 feet from the cross-cut. A north drive from the end of the west cross-cut was driven along a slide for 177 feet, a little gold being seen at times.

At 1,155 feet north from the main cross-cut the No. 3 east cross-cut was put out 106 feet. At 1,450 feet north No. 4 east cross-cut was put in 76 feet. At 1,459 feet north a rise was put up and connected with the 2,080-ft. level in 1907. From the foot of this rise the No. 2 west cross-cut was put in 180 feet. Cross-cuts were put out west from this rise at 30 feet, 60 feet, and 100 feet below the 2,080-ft. level. At 30 feet below the 2,080-ft. level the footwall of the lode was met 7 feet west of the rise, and it carried 2 ft. 6 in. of mineralized ore, followed by 30 feet of solid quartz, with veins for 55 feet. At 42 feet in the cross-cut a rise was put up in mineralized quartz veins. A drive north for 38 feet proved a short shoot of payable stone, which was stoped out early in 1898.

A south drive for 51 feet carried a full face of unpayable stone, and a rise was put up to the 2,080-ft. level. At 60 feet below the 2,080-ft. level disturbed strata were passed through, and a drive north was put in 270 feet. Mineralized quartz was met with in this drive 60 feet north of the cross-cut, and in the face 4 ft. of quartz, with a good footwall, was exposed. At 86 feet north of the cross-cut a rise was put up 30 feet on 2 ft. of mineralized quartz. At 120 feet below the 2,080-ft. level a cross-cut was put in to the west for 75 feet, but no lode was met with. On driving north some promising stone was met with at 150 feet, and followed for 15 feet before the mine closed down.

At 56 feet north in the north drive off the west cross-cut a rise was put up to a height of 54 feet, passing through several makes of stone, some of which carried a little gold.

*Plans.*—The transverse section (Fig. 27) shows the structure of all the available workings. The details of the lode in the upper levels were taken from the sections prepared by the mine manager.

The following yields were recorded:—

| Year. | Tons. | Yield. | | |
|---|---|---|---|---|
| | | oz. | dwt. | gr. |
| 1899 .. .. | 4,745 | 2,330 | 15 | 12 |
| 1900 .. .. | 11,190 | 6,676 | 19 | 12 |
| 1901 .. .. | 11,765 | 3,854 | 0 | 2 |
| 1902 .. .. | 7,461 | 3,350 | 14 | 18 |
| 1903 .. .. | 7,240 | 3,946 | 11 | 0 |
| 1904 .. .. | 6,446 | 3,339 | 11 | 12 |
| 1905 .. .. | 6,183 | 2,869 | 19 | 6 |
| 1906 .. .. | 7,123 | 3,922 | 2 | 0 |
| 1907 .. .. | 2,597 | 1,131 | 8 | 0 |
| 1908 .. .. | 1,370 | 415 | 0 | 0 |

STAR OF THE EAST COMPANY.

(Pl. VII., VIIa., VIII., IX.)

The Star of the East Company was formed in 1879, and started operations by sinking a shaft near the Yarrowee Creek to a depth of 230 feet. Small quartz veins were met with in the drives at this level, but nothing payable was disclosed. Early in 1880 a new shaft—the No. 1—was started, and passed through only 31 feet of basalt, being near the edge of the basalt flow on the western bank of the Yarrowee Creek. At a depth of 100 feet a quartz spur 6 ft. wide was struck, which yielded a prospect of gold. The shaft was sunk to a depth of 465 feet before opening out at 463 feet in September, 1880. A cross-cut west, at the 463-ft. level, was put out for 305 feet, and another east for 150 feet, without locating any downward continuation of the quartz cut in the shaft. An opening was made at 30 feet below the point where the quartz was struck in the shaft, and a drive was put in for a distance of over 100 feet, but only a few spurs were met with. A rise was then put up over this drive on the quartz, which was found to be much broken up and of poor value. At 62 feet west of the shaft, drives 90 feet in length were put in north and south on a quartz leader, but nothing payable was disclosed in 1881.

Shaft-sinking was resumed, and a depth of 670 feet was reached in September, 1881, and cross-cutting west for the Guiding Star lode was commenced at a depth of 660 feet. By September, 1882, the total length of the cross-cut was 532 feet, where work ceased (see p. 177). A level was opened at 200 feet in the shaft, and at 13 feet east a drive was put in south for over 100 feet, but nothing payable was met with. A cross-cut east was started in August, 1883, after the company had erected a more powerful winding plant than that formerly in use. At 148 feet from the shaft a highly mineralized quartz vein was passed through in hard country. The cross-cut was extended to 200 feet, but not meeting with anything more promising, a level was driven north on the mineralized quartz vein. At 15 feet north of the cross-cut a large body of quartz was struck, but no gold was obtained in it. The drive was continued for 160 feet on a reef which varied from 2 ft. to 4 ft. in width, but not payable. A drive was put in south for 100 feet, but the quartz vein continued small, only about 9 in. wide. Early in 1882 a Government grant

of £400 enabled the company to extend the north drive to 320 feet without meeting any improvement; the two walls were 20 feet apart and well defined, carrying a few quartz leaders between them. Two crushings were obtained, but these proved unpayable, and on the 14th May, 1884, the mine closed down owing to the non-payment of calls. The capital of the company was increased by raising the amount payable on each share from 16s. 8d. to £1 16s. 8d., and the issuing of 12,000 shares at £1 each.

The development in the Band and Albion mine, where a south pitching shoot of gold was struck (see p. 122), enabled the company to dispose of the shares, and baling was started in September, 1884. The western cross-cut, at the 660-ft. level, was extended, and shaft sinking recommenced. During 1885 a lode was cut at 128 feet east of the shaft, at the 760-ft. level, and drives were put in north and south along its course. In August, 1886, the Guiding Star line of lode was cut in the 660-ft. level cross-cut at a distance of 1,612 feet from the shaft. The lode was small at this point, but on driving north the stone opened out, and a trial crushing from it yielded over an ounce of gold to the ton. In September, 1886, the site for the No. 2 shaft, to work the Guiding Star lode under better conditions, was selected about 1,800 feet west of the No. 1 shaft. In March, 1887, while sinking the No. 1 shaft, rich specimens were obtained from a formation at a depth of 1,230 feet. At the 1,230-ft. level quartz was cut in disturbed country at 60 feet west of the shaft. Sinking of the main, or No. 1, shaft to a depth of 1,420 feet was continued, and during 1888 the Consols line of lode was cut on its southern pitch. At this time the No. 2 shaft had reached the shoot of gold on the Guiding Star lode, and the mine now launched out on a bright career as a gold producer.

*Structure.*

The structure of the mine is important as showing the relationship of the three lines of lode exposed in the Ballarat West mines, together with a continuous section of the intervening strata. The No. 1 shaft, situated on the west bank of the Yarrowee Creek, passed through 10 feet of surface soil, 31 feet of basalt, and 9 feet of clay before entering the bedrock, which can be seen outcropping under the basalt along the hillside to the east and north. This shaft was inaccessible for survey, and consequently no information was available there regarding the Consols line of lode.

The No. 2 shaft, situated 1,650 feet south-westerly from the No. 1 shaft, passed through the following layers before reaching bedrock at 299 feet:—

| Formation. | Thickness. |
|---|---|
| | Feet. |
| Surface soil .. .. .. .. | 5 |
| Basalt (first rock) .. .. .. | 75 |
| Clay .. .. .. .. | 5 |
| Basalt (secondrock) .. .. .. | 95 |
| Clay .. .. .. .. | 6 |
| Basalt (third rock) .. .. .. | 48 |
| Drift and clay .. .. .. | 59 |
| Total .. .. .. | 293 |

The geological section of the No. 2 shaft workings consists of a main anticlinal axis, the Albion, at 900 feet west of the shaft. Westwards from this fold regular west-dipping strata show up to the Albion lode, and, as proved by a cross-cut, they continue west of the lode for a further distance of 100 feet at least. Eastwards from the Albion anticline a general easterly dip extends to the Guiding Star syncline, which lies 150 feet to the west of the shaft at the 603-ft. level, and 70 feet to the west of it at the 2,189-ft. level. This syncline is symmetrical at the 603-ft. level, and also in each level below the 1,395-ft. level, but in the intervening levels, owing to compression and overfolding, the syncline occurs in strata which, at the 1,100-ft. level, have a general easterly dip of 70°. At this level the centre of the syncline is at 175 feet west of the shaft. This overthrust fold occurs also at a similar depth in the mine to the north (see p. 172).

Going eastwards from the shaft the Guiding Star anticline is met in the 2,189-ft. level at 180 feet, at which point the anticline is a well-defined broad arch (Pl. VIII.). Further eastward a compound syncline occurs, consisting of a trough, at 750 feet, and another at 930 feet, with an anticline at 850 feet from the shaft. This compound syncline (The Consols), at the 2,189-ft. level, carries laminated quartz and black slates, apparently the downward continuation of the Consols line of lode, which will meet the syncline within 100 feet below this level. The black slate series is repeated on either side of the minor anticline, and occurs again dipping east at 710 feet from the shaft. No further trace of the black slates occurs in the cross-cuts, excepting on the Guiding Star syncline, at the 603-ft. level, where they are exposed dipping to the west in association with the lode, and dipping to the east on the west side of the syncline opposite the shaft. This series of beds will extend downwards to about 800 feet from the surface. The next exposure of this series occurs on the Albion lode and westward thereof, where the beds are repeated. The chief feature throughout is the occurrence of the three lodes in the same series of beds—the auriferous lodes forming on the lowermost member of the series, which only attains a thickness of 60 feet to 80 feet, and only where the lodes dip west are they auriferous.

To connect the Albion lode with the Guiding Star lode over the Albion anticline, about 2 miles in length of strata would be necessary. This means that on the Albion anticline denudation and faulting, associated with the folding, has removed a total thickness of nearly 5,000 feet of strata from the present bedrock level to the black slate series alone, and there is evidence of hundreds of feet of strata associated with the folding which existed above that horizon.

At the 2,189-ft. level, at 360 feet west from the shaft, an auriferous quartz spur was followed northwards for several hundred feet. Although of low-grade, this spur, on account of its width of 60 ft. or more, was profitably worked for some time. The horizon of the beds containing this formation occurs stratigraphically at about 600 feet below the black slate series. Insufficient data was available to definitely point to the existence of another favorable zone, but the evidence at this point, and also at the 1,800-ft. and 1,900-ft. levels in the Band and Albion No. 9 shaft to the north, favours the view that another auriferous zone occurred, although of low-grade, in both places. In their occurrence both these agree with the Ballarat East field, as they are in east-dipping strata in marked contrast to the main lodes in the Ballarat West field.

Faults in the strata are of comparatively small importance, and they follow the common rule of the field by dipping into the folds. In the east-dipping strata they appear to predominate, but the amount of displacement is usually small. In the syncline in which the Consols lode occurs, faults were encountered with such frequency that they rendered the following of the lode a matter of extreme difficulty, and combined to make the lode unpayable, although its value was such as would yield a profit under favorable conditions. In the cross-cuts three beds of fault rock or pseudo-conglomerate were observed, two of which occurred west of the Albion anticline, at the 1,495-ft. level, lying respectively 930 feet and 932 feet from the shaft. In character they consist of from 1 foot to 3 feet of slate and sandstone fragments, the latter rounded, but the slates usually angular with cleavages at all angles, the matrix being a re-cemented sandstone.

At the 1,495-ft. level mineralized water, with carbonic acid gas under pressure, was met with 800 feet west of the shaft, and at the 2,189-ft. level a similar spring occurred at 400 feet east of the shaft. Carbonated waters depositing travertine were numerous below the 1,099-ft. level, but the two cases mentioned above partook more of the nature of mineral springs, little mineral deposition taking place.

The plans and transverse section show the structure and the intervening strata between the three lodes of the Ballarat West field.

*Details of the Various Levels, No. 1 Shaft.*
(Pl. viiiA.)

*300-ft. Level.*—During 1896 and 1897 a cross-cut east at this level was driven a distance of 440 feet without meeting anything defined in the way of a lode. At 270 feet from the shaft a rise was put up on some quartz leaders and spurs, but failing to meet with anything payable, it was suspended at about 30 feet above the level. A south drive from the foot of the rise carried, for a distance of over 100 feet up to a cross-course, a large formation of quartz leaders in slate. No payable stone was located on the south side of the cross-course, and work was discontinued at this level in April, 1897.

*660-ft. Level (West Crosscut).*—When the company was reconstructed in 1885, the face of the west cross-cut stood at 532 feet from the shaft (see p. 175). Cross-cutting was resumed in May, under partial assistance from the Government, and the track of the Guiding Star lode was cut at 1,612 feet west of the shaft in August, 1886. The lode was associated with a pyrites seam 10 in. wide, which, on driving north, was replaced by quartz showing gold freely. Stoping above the level was continued to a height of 165 feet at the highest point and to a depth of 180 feet below the level, while the north drive was put in 875 feet and the south drive 740 feet from the cross-cut. In 1888 the workings in the south drive were connected with the No. 2 shaft. In 1900 operations were commenced in the Guiding Star shaft to work the lode to the outcrop.

*660-ft. Level (East Cross-cut.)*—In March, 1897, the cross-cut east was re-opened and repaired with a view to further prospecting. The north drive on the lode was repaired and driving resumed. At 340 feet from the cross-cut 15 in. of quartz rising to the north was proved, and continued to 390 feet. At 400 feet a rise was put up on the track to intersect the quartz, which had risen over the back of the drive. The lode in the rise increased to 2 ft. in width, and carried a large amount of mineral to 70 feet in height, where the stone pinched. At 417 feet north of the cross-cut the drive was stopped, the lode track there being 4 ft. wide, carrying 12 in. of solid quartz.

*1,100-ft. Level.*—The cross-cut east at this level was started in June, 1895, and cut the lode track at 160 feet from the shaft. The "track," 2 ft. wide, carried a little stone, and was driven on north, but for 90 feet only disturbed country was met with. From this point the lode improved, and at 128 feet it carried stone the full width of the drive. This stone continued to 180 feet, where a little gold was found. At 200 feet north the stone diminished in size, and slate appeared on the footwall. At 300 feet driving was stopped, the lode having become very small.

*1,200-ft. Level.*—The lode in this level was cut 12 feet east of the shaft in February, 1895, and showed 12 in. of stone in the cross-cut. The stone contracted as driven on north, being only a few inches wide at 120 feet from the cross-cut. At 154 feet a trial crushing of lode material from the full width of the drive yielded only 2 dwt. to the ton. A rise was put up at 120 feet from the cross-cut, and at 70 feet up it showed 15 in. of quartz, which pinched to 6 in. at 100 feet. At 125 feet broken country was passed through; at 153 feet quartz 1 ft. 6 in. wide was risen on; and at 179 feet a strong stream of water was encountered, and rising was stopped.

*1,420-ft. Level.*—This level was opened early in 1888, and cross-cutting west was commenced. At 320 feet from the shaft the lode was intersected, and a drive north proved that the formation was well defined and of payable quality for a length of 195 feet up to a fault, which displaced the lode for a distance of 130 feet. Beyond this fault a lode 3 ft. wide was followed. Stoping over this level was commenced in 1888, and a length of 620 feet of payable stone was opened up south of the fault. This stone ranged in width from 2 ft. to 4 ft., and continued to 250 feet south of the cross-cut. Stoping was carried on until 1891. In August, 1896, the main level was repaired, and the No. 2 rise repaired and risen to 60 feet above the intermediate level (1,360-ft.), at which level the drive north carried 4 feet of stone showing gold occasionally. This continued to 90 feet, where the stone became smaller. Stopes above this point connected with the Band and Albion No. 10 shaft workings.

*Intermediate (1,470-ft. Level).*—Below the 1,420-ft. level the No. 1 winze was sunk, and a drive south was commenced, showing at 40 ft. that the lode was 3 ft. wide.

*1,520-ft. Level.*—The shaft reached a depth of 1,547 feet towards the end of 1888, and in 1889 the western cross-cut, at the 1,520-ft. level, cut the Consols lode at 460 feet, where driving was commenced to the north. In this north drive a lode from 2 ft. to 4 ft. wide showed gold freely, and it was followed for a length of 388 feet. From 300 feet to 400 feet the lode tapered from 3 ft. 6 in. to 2 ft., but maintained its payable quality. At 410 feet a slide occurred, which appears to have terminated the golden shoot, as a cross-cut put in to the east failed to locate it. At 437 feet north of the main cross-cut the reef was very small and poor, and continued without improvement to 515 feet. Stoping over this level was commenced in 1889, and continued until 1892. The No. 1 winze from this level carried a lode averaging 2 ft. wide, which showed fair gold the whole way. In the No. 2 winze the lode averaged 2 ft. 6 in. in width, and was of good quality.

*1,520-ft. Level South.*—At 145 feet south the lode carried 3 ft. of quartz showing gold. This widened to 4 ft. at 160 feet, and continued to 180 feet, being nicely laminated. At 207 feet the quartz had contracted to 2 ft., widening to 5 ft. at from 270 feet to 310 feet, and maintaining a good value. Good quality quartz, averaging 2 ft. 6 in. in width, was proved to 560 feet, and was followed by a small, poor reef. Driving ceased at 573 feet in September, 1891. In the No. 1 winze the lode, which was at first 3 ft. wide, contracted to 2 ft. at a depth of 66 ft., but it carried payable gold down to a depth of 104 feet. The No. 2 winze was started in a large body of stone, which was only 3 ft. in width at 65 feet. At 131 feet the winze broke through to the 1,620-ft. level, where the reef was very flat. This connexion proved that the gold extended from level to level. The No. 3 winze started in the lode 5 ft. wide carrying good gold; at 50 feet the lode was 4 ft. in width; and at 75 feet it was 3 ft. wide, and of good payable quality. When connected through to the 1,620-ft. level the distance from level to level (100 feet vertical) was 150 feet on the underlay. In No. 4 winze the lode (width not given) was of payable quality from level to level.

*1,620-ft. Level.*—In the north drive the lode widened from under 1 ft. in the cross-cut to 2 feet of fair quality at 80 feet, and to 260 feet it averaged 2 ft. of fair quality. From 260 feet to 420 feet the lode proved irregular and small. At 430 feet the stone widened to 1 ft. 6 in.; at 450 feet it reached a width of 2 ft. 6 in, but to 530 feet it was of poor quality. Driving was continued on a track with the lode small and poor. At 900 feet the stone widened out to 1 ft. 8 in. for a short distance, but carried no gold. The drive was extended to 975 feet, or within 15 feet of the north boundary, without encountering any new makes of stone. The lode at this level was cut at 480 feet west of the shaft, and driving south was started in March, 1891. The lode where intersected in the cross-cut was small, but showed a little gold. As the south drive advanced, the lode improved in size and quality; at 50 feet south it was 1 ft. 6 in. wide; at 90 feet south, 2 ft. wide; at 120 feet south, 2 ft. 6 in., enlarging to 5 ft. at 140 feet, and to 6 ft. at 160 feet south. The lode here carried good gold values. To 300 feet south the lode was rich, and averaged over 5 ft. in width. To 400 feet south it maintained a width of 4 ft., and was of good quality. At 425 feet the shoot of stone was passed out of, and the lode became small, and a blank portion of the reef channel was driven in for 60 feet; the lode then made again at 513 feet, being 2 ft. wide, and showing gold. At 540 feet the reef had widened out to 5 ft., and it carried fair gold values; at 620 feet the lode was 4 ft. wide, but tapered gradually till it cut out at 730 feet. Driving was continued in the lode channel, the quartz in which was small and irregular, and of no value up to the south face at 1,168 feet.

In 1895 a diamond drill bore was put in easterly, but much difficulty was experienced in boring. From 40 feet to 47 feet the bore passed through broken country, necessitating tubing; from 47 feet to 315 feet it was in solid country, followed by 10 feet of broken strata. The No. 2 bore east, on an angle, entered broken country shortly after starting. At 322 feet it passed through 12 in. of quartz, and was stopped at 556 feet from the shaft.

*1,720-ft. Level.*—The cross-cut west at this level was started in September, 1890, and in April, 1891, a lode track 2 ft. wide of nicely laminated stone was cut at 540 feet from the shaft, the cross-cut being extended to 566 feet in strata carrying quartz but no gold. In the north drive for 100 feet no lode was met with, a slide having disturbed the formation. At 100 feet north a cross-cut east cut 22 feet into the lode, which was of slate and quartz leaders intermixed. The north drive was continued to 266 feet without meeting with any quartz, the country being broken in the face by the influence of the slide. At this point the lode was heaved 20 feet to the west, and was, where picked up, 2 ft. wide, and of poor value. From 280 feet to 340 feet no change in the size or value occurred, but from 350 feet to 380 feet the lode averaged 1 ft. 6 in. wide, and showed coarse gold. At 400 feet the lode was small, and at 450 feet the north drive again entered disturbed country, which continued to the face at 457 feet.

Driving south was commenced on a strong body of quartz carrying gold, which maintained an average width of 2 ft., and was of fair quality for 130 feet, after which it decreased both in size and value. For 200 feet the lode was of poor quality, and irregular in size, though at times up to 2 ft. in width. At 350 feet south the lode became more solid, and quartz 2 ft. wide of improved appearance came in. At 360 feet the lode widened out to 3 ft., and carried good gold values. At this point much water was met with, which necessitated ceasing work for over three months whilst the mine was draining. Stone averaging 4 ft. in width was driven on to 480 feet, where the lode became broken and poor in quality. At 530 feet stone 2 ft. wide came in, but continued for a short distance only. At 560 feet a new make 3 ft. wide showing gold came in on the footwall, but this only continued for a few feet, after which disturbed country was followed up to 640 feet. At 655 feet south stone 3 ft. wide showing a little gold was met with, and this make continued to 700 feet before it pinched. A small formation of poor value was driven on to 800 feet; at 830 feet 2 ft. of quartz, which at first carried no gold, came in, but at 850 feet it was 1 ft. 6 in. wide, and showed a little gold. At 950 feet south this shoot of golden stone reached a width of 5 ft., and averaged 3 ft. 6 in. wide up to 1,050 feet, where the shoot of gold was passed out of. The lode track continued from 2 ft. to 3 ft. in width, but up to the face at 1,116 feet it only carried bunches of quartz mixed with the slate.

*Rises and Winzes (1720-ft. Level).*—The No. 2 rise was put up from a point 200 feet south of the cross-cut. At 30 feet up there was 3 ft. of stone, which carried gold at 50 feet, and continued of fair quality up to 121 feet, where the rise broke through to the level above. In the No. 3 rise, 300 feet south of the cross-cut, there was 3 ft. of fair stone at 40 feet up, widening out to 4 ft. at 70 feet up the rise. In the No. 4 rise, 400 feet south of the cross-cut, there was 6 ft. of good payable reef at 20 feet up; at 90 feet up it was 4 ft. wide, and of good value; and at 112 feet it was 3 ft. wide, carrying fair gold. In the No. 5 rise, 500 feet south of the cross-cut, the stone at the foot of the rise was small and poor, and continued so for 40 feet. At 60 feet up the rise the stone was 2 ft. wide, and carried gold; and at 112 feet up it was again small. At 138 feet the rise connected with the level above. In the No. 6 rise, 600 feet south of the cross-cut, at 12 feet up the reef was 2 ft. 6 in. wide, showing gold, widening to 5 ft. of good value at 50 feet up, and then

tapered off to 1 ft. 6 in. at 118 feet. At 138 feet the rise broke through to the level above.

In the No. 8 rise 800 feet south of the cross-cut the reef came in at 20 feet up; at 30 feet it had widened out to 1 ft., gradually increasing to 4 ft. of good quality stone at 90 feet; at 118 feet it passed through a shoot of stone, and connected with the upper level at 146 feet. In the No. 9 rise, 900 feet south of the cross-cut, rising was commenced in a big reef, which at 30 feet up maintained a width of 4 ft., and showed fair gold. At 80 feet the shoot of golden stone was passed out of, but a narrow make of stone continued to 123 feet. At 149 feet a connexion was made to the level above.

*1,820-ft. Level.*—The cross-cut at this level was started in May, 1892, and the lode channel was cut at 550 feet from the shaft in March, 1893. As the water from the abandoned mines of the Band and Albion group was at this time making its way through the upper levels, means of overcoming the difficulty was sought. A connexion was made by extending this cross-cut and connecting to the No. 2 shaft, where a large beam engine pumping plant was erected. In 1895 this work was completed, the distance between the shafts by this cross-cut being 1,800 feet. In April, 1894, a north drive was begun at this level. This was carried in a total of 78 feet, but the lode continued small and poor in very hard country.

The south drive on the lode at the 1,820-ft. level was commenced in July, 1893. The lode, on an average, was 1 ft. 6 in. wide, and showed a little gold for a distance of 140 feet, where a slide was met with, which threw the lode to the west as going south. Where the lode was again picked up it was poor and small, but it widened out to 3 ft. at 280 feet, tapering again to 2 ft. at 300 feet, without showing any improvement in value. The stone increased in size, and at 460 feet it was 4 ft. wide, showing a little gold. A bulge in the reef attained a width of 5 ft. at 500 feet, and its quality was fair up to 540 feet, where it pinched. Another make of stone came in at about 600 feet, but its gold value was small to 650 feet, where it was 2 ft. wide. This lode widened out to an average of 4 ft. 6 in., and continued to 830 feet, then tapering off to 2 ft., and the gold dying out in it at 900 feet. The lode was small, and under 1 ft. 6 in. to 1,040 feet, where 2 ft. of quartz with fair gold was met with, but, although the reef increased its size, the gold was irregularly distributed. At 1,150 feet the reef was 4 ft. wide, and showed gold occasionally. At 1,180 feet a slide cut off the lode, and broken country was driven in up to 1,228 feet from the cross-cut, where driving ceased.

*Rises and Winzes (1,820-ft. Level).*—No. 1 rise was put up 375 feet south of the cross-cut. In this rise a small lode was followed to 60 feet, when it enlarged to 2 ft. wide at a height of 90 feet. This rise, in which nothing of consequence was met with, broke through to the level above at 108 feet on the underlay of the lode.

The No. 2 rise, 475 feet south of cross-cut, was put up on stone 4 ft. in width, showing gold, which tapered to 1 ft. wide at 80 feet, payable stone being risen on the whole way. At this point the first shoot of stone was passed through. At 107 feet up the rise the second shoot of stone, 2 ft. 6 in. wide, and payable, was met with, and in this stone the rise was continued till it broke through to the level above at 117 feet.

The No. 3 rise was commenced 575 feet south of the cross-cut. The lode at the foot of the rise was 12 in. in width, and continued small up to 90 feet, where it became disturbed, and at 115 feet up it was 4 ft. wide, and of poor quality.

The No. 4 rise was started at 675 feet south of the cross-cut. It started on the northern edge of the second make of stone, and disturbed country was risen in for 20 feet, after which the reef increased in size, widening out to 3 ft. at 40 feet up, and to 4 ft. at 70 feet, averaging 3 ft. 6 in. throughout. It was of medium quality up to 143 feet, at which point the level above was connected with.

The No. 5 rise was put up at 775 feet south of the cross-cut, and near to the centre of the shoot of gold. At 30 feet up the lode was 3 ft. wide, laminated and gold-bearing. To 90 feet the reef carried a little gold, and averaged 3 ft. 6 in. in width, but its size and value diminished. At a height of 132 feet the rise connected to the 1,720-ft. level.

The No. 6 rise, 875 feet south of cross-cut, was commenced near to the southern end of the shoot, and it carried only a small lode for 100 feet, at which point a new shoot of stone came in, and widened out to 2 ft. at 134 feet up a point 4 ft. under the 1,720-ft. level.

The No. 7 rise was 975 feet south of the cross-cut. It commenced on a small lode of low value, and no change occurred till 40 feet up, where the shoot of stone pitching south was met with. The lode widened out to 3 ft. at 90 feet and to 3 ft. 6 in., at 120-ft., showing gold and continuing gold-bearing to 150 feet. At 171 feet, on the underlay, the rise connected with the level above.

The No. 8 rise was 1,075 feet south of the cross-cut. It was started on a flat portion of the lode (probably near the apex of the anticlinal fold). At 24 feet up the rise it was 2 ft. wide and carried gold, but owing to the flatness of the lode, a cross-cut was put in 20 feet east from the main level and a rise was started from this face. At 50 feet in height the lode was again picked up and risen in to 70 feet, where another cross-cut east of 20 feet had to be put in on account of the flat underlay of the lode. At 102 feet above the level the lode was 3 ft. wide, but it pinched at 130 feet. At 170 feet this rise connected to the level above.

*2,000-ft. Level.*—In January, 1895, a cross-cut was started west, and at 560 feet from the shaft a large slide dipping south-west was encountered, through which the cross-cut passed, and was continued to 782 feet. At 730 feet from the shaft the strata were dipping to the west. A drive south-westerly was commenced at 550 feet from the shaft. At 110 feet irregular stone and much water was struck, and along this stone the drive was turned southerly. The lode track as followed at this level proved unsatisfactory throughout. The first make of stone, averaging 2 ft. in width, was driven on from 120 feet to 278 feet, and although at times it was of promising appearance, no payable stone was met with. Up to 683 feet from the cross-cut the lode was irregular, and carried only a few inches of quartz, and at 700 feet south a cross-cut east cut a lode 2 ft. wide, to intersect

which the main drive was turned eastward. At 736 feet this lode was 3 ft. 6 in. wide, and of very promising appearance, but at 815 feet it had tapered out to 3 in. Rubbly quartz of no value was followed to 1,000 feet, after which solid quartz up to 3 ft. in width at 1,100 feet was followed up to a cross-course at 1,170 feet. The drive was then turned westerly along this cross-course, and at 107 feet it picked up what was considered to be the lost lode, here 4 ft. wide (this point was 1,287 feet from the cross-cut). At 1,400 feet the lode was 5 ft. wide, and showed fair gold, which continued for 50 feet. At 1,475 feet the lode became small, and the drive was stopped at 1,498 feet from the cross-cut in July, 1897. A winze was then sunk south of the cross-course from the 2,000-ft. level on a lode averaging 3 ft. 6 in. for a depth of 40 feet on quartz of fair quality, on which a drive south was commenced. Very little work was done here owing to the heavy water.

Several diamond drill bores were put in easterly at this depth during 1895. Bore No. 1,* due east at the 2,000-ft. level, cut 6 in. of quartz at 11 feet. At 184 feet a cross-course was met with, the broken country continuing up to 227 feet 8 inches, where drilling was stopped.

Bore No. 2 cut 4 ft. of hard quartz between 82 feet and 86 feet, and at 157 feet it passed through a cross-course; at 273 feet it cut 10 in. of quartz; at 438 feet it cut 12 in. of quartz, followed by 1 ft. 3 in. of slate and 10 in. of quartz; and at 721 feet boring ceased, this being the extent of rods available.

Bore No. 3 cut 2 ft. of quartz at 30 feet, and was put in for a total length of 242 feet. Bore No. 4 was put in for a length of 405 feet 6 inches. Bore No. 5 cut 1 ft. of quartz at 323 feet 2 inches, and was extended for a total length of 326 feet 3 inches.*

A cross-cut was started to test the quartz passed through in the above bores, but it revealed the fact that only valueless quartz leaders in slate had been intersected. At 286 feet driving was suspended at this level.

### *No. 2 Shaft* (Pl. ix.).

Shaft-sinking was commenced in September, 1886, and the following strata were passed through:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| Basalt (first rock) .. .. .. | 80 |
| Clay .. .. .. .. | 5 |
| Basalt (second rock) .. .. .. | 95 |
| Clay .. .. .. .. | 6 |
| Basalt (third rock) .. .. .. | 48 |
| Clay and drift .. .. .. | 65 |

The shaft was bottomed at 299 feet, and was sunk to a depth of 1,400 feet by September, 1891, when a cross-cut to intersect the Guiding Star lode was commenced.

### *Guiding Star Lode Workings.*

*600-ft. Level.*—In September, 1902, a cross-cut west was started at this level to prove the southern portion of the Guiding Star lode, which at this time was being profitably worked in the Guiding Star shaft. At 100 feet west of the shaft the track of the lode was cut, and drives were opened to the north and south. The west cross-cut was extended to 1,440 feet by August, 1904, striking the "granitic dyke" with heavy water accompanying it. The cross-cut was then stopped, and a brick dam was constructed in the cross-cut. In 1909 the dam was removed, and the cross-cut was extended to 1,820 feet, where the Albion lode was cut and driven on to the south. Owing to the water from abandoned workings finding its way into the mine, the cost of pumping was too severe a tax on the resources of the company, and all work ceased early in 1910, before the Albion lode was effectually tested.

Driving south on the Guiding Star lode a well-defined track with laminated mineralized quartz, occasionally carrying a few colours of gold, was followed. At 100 feet the lode was 1 ft. 6 in. wide, and at 200 feet it was 2 ft., but of very poor value. A crushing from the lode, at 245 feet south, gave ¼ dwt. to the ton. At 300 feet the lode was 2 ft. wide, but a little further it became broken. At 420 feet south a slide displaced the lode to the west. The lode was 2 ft. 6 in. wide, and carried a little gold at 474 feet, where a rise was put up for 40 feet without improvement in value. A trial crushing from this stone yielded only 26 dwt. of gold from 25 tons of quartz. The lode soon decreased in size, and only a track was followed to the southern cross-course. The lode, when picked up again to the south-west, showed 1 ft. of quartz of favorable appearance, but it carried no gold. Driving was continued to near the southern boundary, but no improvement occurred in the lode.

*780-ft. Level.*—This crosscut was opened west from No. 2 shaft early in 1888. At 170 feet from the shaft, it cut the track of the Guiding Star lode along which a drive north was put in 600 feet before reaching a shoot of gold coming underfoot from the 660-ft. level of No. 1 shaft. The lode where gold bearing was highly mineralized and varied in width from 2 feet to 4 feet for the first 200 feet. The shoot continued to a cross-course at 1,080 feet north; this cross-course faulted the reef 120 feet east. North of the cross-course the reef was payable and was followed for 300 feet; for 150 feet north of the cross-course it was payable in the stopes and ranged from 1 foot to 5 feet in width. South of the cross-course the stopes were 450 feet in length; the lode ranged from 1 foot to 4 feet in width and carries fair gold values.

*900-ft. Level.*—The Guiding Star lode was cut at 166 feet from the shaft in 1889. In the north drive the quartz was poor for 70 feet and then a little gold was visible in the reef to 200 feet from the crosscut. At 600 feet north the reef was 2 feet wide and payable up to 900 feet, beyond which it was small and poor to the face at 1,010 feet. Stoping above this level was carried on for a length of 300 feet on a shoot of quartz from 1 foot to 4 feet wide. The stopes were exhausted in 1891. From 70 feet to 200 feet north of the shaft a stope 20 feet in height reached the cap of the shoot.

In the south drive, commenced in 1891, the reef was small and poor for 450 feet, but good auriferous quartz was stoped below the level. Poor quartz was followed up to the cross-course at 800 feet south. The cross-course displaced the lode 80 feet south-west. Beyond the cross-course the lode was followed 180 feet to near the south boundary of the mine. A block of reef below this level and south of the crosscourse was payable.

*Annual Report, Secretary for Mines, year 1895.

*1,000-ft. Level.*—In 1890 the cross-cut west at this level intersected the lode at 245 feet from the shaft. Drives north and south were put in. In the cross-cut the reef was 1 foot wide, but it widened rapidly northwards. At 70 feet it was 8 feet wide and carried visible gold and increased in size to 170 feet, where it was 13 feet wide. For the next hundred feet an average width of 12 feet was maintained. It was payable from 80 feet north of the cross-cut. At 340 feet north 23 feet of rich stone was proved, and between this point and a slide at 533 feet the reef averaged 25 feet of solid quartz. Beyond the slide only a little quartz was found in the north drive, but some gold-bearing quartz was found at 750 feet and was followed to 820 feet, where a cross-cut east for 23 feet cut an auriferous lode 2 feet wide. The main drive was turned on an angle to intersect this lode, which was reached at 900 feet north of the main cross-cut. From this point a lode of fair quality 2 feet wide was followed for 30 feet before it pinched out, leaving a track which was followed to a cross-course at 1,053 feet north (November, 1892).

At this level cross-cuts west off the north drive proved the lode to be upwards of 30 feet in width and to carry from 10 dwts. to 15 dwts. of gold per ton (1891 to 1895).

In the drive south from the main cross-cut the lode opened out and at 50 feet it was 10 feet wide. To 250 feet it averaged 11 feet wide, but carried only a little gold: a block of sandstone there came down in the back of the drive and cut out the lode, leaving only 6 inches of quartz on the footwall side. The reef continued small and poor up to 350 feet, where it widened to 1 foot and carried fair gold values. The shoot continued to a slide at 450 feet, beyond which a small mineralized lode was followed to 561 feet (September, 1891). From this point to a slide at 775 feet the lode remained small and poor, but beyond the slide the two walls were 7 feet apart. The track became a little richer in gold as it was followed, but at 880 feet a cross-course came in, beyond which the lode was 5 feet wide tapering to 2 feet wide at 1,000 feet. At 1,050 feet the quartz was 6 feet over the back. The drive was stopped at the boundary of the lease, 1,135 feet south of the cross-cut (November, 1895).

*1,000-ft. Level* (rises, &c.).—From the south face a rise was put up for ventilation and connected with the 900-ft. level in the South Star mine. At 30 feet up the rise the lode was 3 feet wide and carried 1½ feet of solid quartz, which widened out to more than the width of the rise at 50 feet up; at 90 feet up the lode contained galena and iron pyrites and a fair amount of gold. At 94 feet a connexion was made, and at 40 feet a level for stoping was opened north.

A large quantity of payable stone was obtained from the stopes above the 1,000-ft. level both north and south of the main cross-cut, the reef ranging from a few feet up to 30 feet in width. Stoping continued in this portion of the mine until 1901.

*1,100-ft. Level.*—In November, 1890, a drive was started north at 180 feet west of the shaft on a make of quartz 8 inches wide. A rise intersected a large body of quartz with a southerly pitch at 50 feet above the cross-cut. No change occurred in the quartz in the north drive as far as a slide at 275 feet: a little gold was seen at 330 feet, and the lode then improved both in size and quality; at 400 feet the lode was 20 feet wide and continued large; at 550 feet a cross-cut west passed through 70 feet of mineralized quartz before reaching the hanging wall. The lode was large and payable to 980 feet; at 1,020 feet a cross-course threw the lode to the north-east, and it was not located again north of the break at this level. Driving ceased in June, 1893.

In 1891 the south drive was extended 400 feet on the track of the lode, but nothing of value was found in the level, a rise at 200 feet south proving the shoot of quartz to have a northerly pitch.

The stopes over the north drive opened up a lode which in size and quality surpassed anything previously known on the field. A body of quartz over 700 feet long and from 15 to 70 feet wide was taken out completely for a height of over 100 feet. Later operations in 1899 comprised the working of payable quartz veins and spurs west of the main lode at a distance of over 100 feet from the footwall.

*1,200-ft. Level.*—The cross-cut west at this level was opened in October, 1891, and was continued to 250 feet from the shaft without locating the downward continuation of the reef from the level above. At 110 feet from the shaft a drive was started north on a leader 10 inches wide. At 50 feet north 3 feet of poor quartz came up in the floor of the drive and was followed to a slide at 143 feet. North of the slide a small body of quartz with leaders on the hanging wall and a fault on the footwall was followed to another slide at 500 feet. Beyond this slide only spurs were found and a cross-cut put in 150 feet west at 700 feet north failed to locate any quartz in that direction. At 794 feet the main drive cut a slide, but the lode to the north of this did not improve until a formation 3 feet wide was cut at 930 feet; this carried a little gold for a few feet but soon became broken. At 990 feet the lode was cut off by a cross-course, and after passing through several feet of broken country, the drive intersected small leaders at 1,060 feet from the cross-cut, and shortly afterwards a formation consisting of 20 feet of quartz carrying a little gold. During 1894 work ceased in this drive at about 1,400 feet north, nothing of value having been located, although the rises from this level connected with the gold-bearing stopes below the 1,100-ft. level. Results were poor, especially towards the close of 1900.

*1,300-ft. Level.*—Cross-cutting west at this level began in 1893, and drives were opened out at 100 feet west of the shaft as the cross-cut at 1,500-ft. level had failed to locate any ore body further to the west. To the south nothing of value was located, the drive being put in 540 feet on small and poor quartz.

North from the cross-cut a small irregular body of valueless quartz was driven on to a cross-course at 1,125 feet north, beyond which a large body of quartz was followed for 350 feet. In 1899 stopes were opened on this body of quartz, which was of large dimensions but poor.

Below the 1,300-ft. level no work was done on the Guiding Star line of lode. This was due to the fact that the formation had died out on the syncline above these levels. With the northerly pitch the large stone on the syncline came down to the 1,300-ft. level in the northern end of the

mine, and was located in the No. 9 shaft of the Band & Albion Company to the north, but in that level, although highly mineralized, it was poor in gold.

*Albion Lode Workings* (Pl. ix.).

*930-ft. Level.*—At this level a drive was opened out from the No. 1 rise, and at 12 feet north 18 in. of payable stone was cut, which soon tapered off and continued small. At 60 feet the walls were 6 feet apart with 8 in. of quartz on the footwall and 2 ft. on the hanging-wall, gold being visible in the stone on both walls. This lode extended up to a break at 80 feet, on the north side of which the lode was 1 ft. wide, increasing to 1 ft. 6 in. at 140 ft., where a slide was met with. Beyond the slide the lode was 1 ft. 3 in. wide at 158 ft. north. At 185 feet the lode track was 2 ft. 6 in. wide, showing 9 in. of quartz on the footwall. At 200 feet the lode was 1 ft. 6 in. wide, and occasionally showed gold. At 210 feet north the drive was stopped.

At 15 feet in the south drive there was 18 in. of payable stone, widening out to 2 ft. at 30 feet, where it showed very fair gold. At 50 feet the lode was 2 ft. 6 in. wide, and showed gold of very fair quality, which continued up to 80 feet, where it increased in width to 4 ft. This width was maintained to 100 feet south, and then the lode tapered, being 2 ft. wide at 150 feet south. At 180 feet south the lode had contracted to 8 in. of medium quality stone, which again widened out to 2 ft. at 200 feet, and continued to increase in size. At 300 feet south the reef was 6 ft. wide, but carried only a little gold, and at 330 feet south it showed stone of payable quality 4 ft. wide, which soon died out. The reef channel then consisted of black mineralized slate with spurs of quartz from 400 feet to 440 feet, where a break occurred, which threw the lode to the west, in which direction the drive was turned. The lode, where picked up south of the slide, was 6 ft. in width from wall to wall, and showed 12 in. of quartz on the hanging-wall, the remainder being black slate. The reef continued under 18 in. in width up to the face at 638 feet south.

Stoping above this level was carried out to a slide which showed in the south drive, and also in the main 1,100-ft. level (Pl. ix.). This block of ground was exhausted by 1902, and abandoned till 1909, when the lode was picked up above the slide and the main rise connected through to the cross-cut at the 600-ft. level.

*1,000-ft. Level.*—From the No. 1 rise above the 1,100-ft. level a north drive was put in, and at 30 feet the lode was 4 ft. wide. At 70 feet the lode had narrowed to 1 ft. 6 in., but it soon increased in width to 3 ft. of payable stone, narrowing again at 90 feet north to 1 ft. 8 in. wide. In the south drive, at this level, 1 ft. 8 in. of payable lode was driven on at 30 feet from the rise, and at 85 feet south it increased in size to 2 ft. 6 in. wide, and was of splendid quality. At 100 feet the lode was 3 ft. 6 in. wide and payable. To 135 feet the lode averaged 3 ft., and at 160 feet it was 4 ft. wide, showing fair gold. Stoping above this level proved the lode to be of payable quality, and averaging 3 ft. wide.

*1,100-ft. Level South.*—The lode, when intersected at this level at 1,900 feet west of the shaft, in May, 1898, proved to be 2 ft. wide, well laminated, and carrying payable gold. At 50 feet in the south drive the lode was disturbed for a few feet by a break. From 60 feet to 130 feet the lode averaged 1 ft. 8 in. wide, and carried fair gold, and from 130 feet to 190 feet it was very small, but for the succeeding 50 feet it maintained an average of 1 ft. 6 in., and was of good quality, being exceptionally rich at 214 feet. From 250 feet to 650 feet the lode was small and unpayable, but at 650 feet an improvement in size took place, and to a break or slide at 795 feet it averaged 2 ft. in width and carried a little gold. At 900 feet south another break occurred, which threw the lode 20 feet to the west, and the lode was only 8 in. wide between these breaks. South of the break a cross-drive was put in, which cut the parallel lode at 60 feet from the main lode, the western lode at this point being smaller than where cut at 800 feet back in a cross-cut, which had been put out west in order to sink a winze from it at 75 feet south of the main cross-cut. In the western cross-cut, which was carried out to 320 feet, some quartz veins and mineralized slates were met with, at 40 feet west of which the strata gave out much water. At 240 feet a network of cross quartz veins were intersected.

In the 1,100-ft. level north drive the lode for 170 feet north was 2 ft. wide, and carried gold throughout. At 170 feet a shoot of stone came in, which maintained a width of 1 ft. up to the north face at 224 feet.

*Rises and Winzes.*—No. 2 rise was started 100 feet north of the No. 1, and carried a well-defined lode, which was 1 ft. 3 in. wide at 60 feet up and of promising appearance. At 84 feet the lode was 2 ft. wide and payable. At 108 feet a connexion was made with the 1,000-ft. level, the stone passed through for the last 35 feet having been of good quality.

A main winze was sunk from the cross-cut off the main south drive at 75 feet from the main cross-cut. At 24 feet down several quartz leaders were passed through. At 70 feet the lode was met with, the winze having been started west of the lode and sunk vertically to meet the lode on its westerly underlie.

The No. 1 north rise was started at 20 feet north from the cross-cut in May, 1898. For 20 feet the lode was 2 ft. 6 in. wide and payable, and from 20 feet to 40 feet it averaged 3 ft. 6 in. wide of stone of improved quality. At 55 feet the lode carried 8 in. of laminated quartz on the footwall, accompanied by black slate and rubbly quartz for a width of 3 ft. At 70 feet up it had increased to 1 ft. 6 in. of solid quartz. At 80 feet the lode formation was 3 ft. wide of slate and quartz, and at 100 feet up it widened out and carried good gold. At 134 feet the quartz was the full width of the rise, and showed fair gold, the quartz pitching north 5 feet in 20 feet. At 153 feet up the rise the quartz was 1 ft. 6 in. wide, decreasing to 1 ft. 3 in. at 160 feet up, but carried as much gold as when it was 4 ft. in width. From 160 feet to 200 feet the rise carried 1 ft. 3 in. of payable stone. A plat or recess was cut at 170 feet up (930-ft. level) for an intermediate level, and to facilitate further rising. From 200 feet upwards the lode increased slightly in width, being 1 ft. 8 in. wide at 220 feet, and of medium quality. This width was maintained to 250 feet, where it started to decrease in size, but still maintained a good quality. At 274 feet there was a very small lode, which continued to 300 feet, and 320 feet

above the 1,100-ft. level it was only 8 in. wide and of poor value.

*1,500-ft. Level.*—The western cross-cut intersected the lode at 2,000 feet from the shaft in June, 1897. The lode was 3 ft. wide, and gave fine gold in dish prospects. Driving north the lode was broken and irregular, consisting of intermixed slate and quartz, and nothing definite was located in 600 ft. of driving.

In the south drive a lode, which attained a width of 6 ft. at 50 feet from the cross-cut, was followed, and at 110 feet it had diminished to 2 ft. in width. The drive carried a track consisting of slate and mineral veins with but little quartz up to 300 feet, where a make of quartz came in, which increased to 1 ft. 8 in. wide at 400 feet, and continued to 550 feet, with an average width of 1 ft. 8 in. A little gold was seen at 580 feet south, but the lode was small up to the face at 625 feet.

Below the 1,500-ft. level a winze was sunk to the south of the cross-cut. A plat was opened out at 60 feet in depth, and the footwall of the lode was cut at 8 feet to the east of the winze. South the lode averaged 4 ft. in width, being payable for 50 feet, then broken and irregular, but carrying a little gold up to 80 feet. This block of stone was stoped out to the 1,500-ft. level, but no deeper work was done on account of the water proving too heavy.

Above the 1,500-ft. level a rise was started which eventually connected with the winze from the 1,100-ft. level, and by this means the block of ground was worked. All mullock and quartz having to be thrown down, while the timber and tools were lowered from the 1,100-ft. level, such a method was costly and inconvenient. At the 1,400-ft. level the lode north averaged 4 ft. for 170 feet, the stone being highly mineralized. To 200 feet the reef averaged 2 ft. wide. At the 1,300-ft. level (200 feet up the rise), the lode was smaller, averaging in width 1 ft. 8 in., which continued to 350 feet above the 1,500-ft. level.

In June, 1897, a drive north was commenced on a lode which became more defined as it was driven on, although somewhat unsettled near the cross-cut. At 130 feet the quartz was 2 ft. wide in the bottom of the drive, but it soon gave way to quartz veins and slate. This class of lode track continued to 400 feet, where a make of quartz 1 ft. 3 in. wide came in on the footwall, followed by a break, the lode continuing irregular.

Stoping on the Albion lode was limited, and owing to the distance from the shaft, the cross-cuts were few and separated by a distance of several hundred feet, making the working of these very costly until airways were put through. Owing to the frequent handlings, only high-grade stone was taken out, as, when the lode was small, it was unpayable, and, further, although in a separate lease to the No. 2 shaft, royalty had to be paid on all gold won in that part of the mine. When operations ceased, it was due to the flooding of the mine by water coming in along the other lines of reef, this line being comparatively dry. As the cross-cuts were left open, the chance of re-opening or working in the vicinity of the proved ground is now gone.

*Picton's Shaft.*

A prospecting shaft was sunk by the Star of the East Company on private property in 1901. The shaft was sunk through 40 feet of basalt. At 100 feet a plat was cut, and cross-cuts opened out east and west. The east cross-cut reached 60 feet from the shaft, while the west cross-cut, at 150 feet, passed through 1 ft. of quartz, on which a winze was sunk. A drive north was also put in, the lode being 1 ft. 3 in. wide, but nothing payable was located.

*Guiding Star Shaft* (Pl. ix.).

Operations in the deeper levels at the No. 2 shaft not proving satisfactory, and the existence of a block of mineral lode being known above the workings from the No. 1 shaft on the Guiding Star lode, the old shaft of the Guiding Star alluvial claim was located after much searching. A plant was erected, and the shaft was repaired. Between April, 1900, when work commenced, and the end of August of the same year, the shaft was repaired to a depth of 270 feet. It was found necessary to erect a larger plant, and this was completed by May, 1901. At 320 feet a flow of 6,600 gallons of water per hour was met with. At 382 feet 6 inches the cap-piece of the old chamber was met with, the chamber being filled with *débris* and slum to within 3 in. of the back of the level.

The shaft was now cleaned out and deepened, and an old drive, which was also filled up, was cleaned out. At 60 feet from the shaft a formation 4 ft. wide, composed of quartz rubble and slate, was met with. At 225 feet from the shaft the mineral lode, 2 ft. wide, was discovered, and the shaft was then sunk below the 390-ft. level. In sinking for a cistern a "Pencil Mark Indicator" was met with in the north-east corner of the shaft associated with a small lode, and several dishes washed from this showed fine gold. The shaft was deepened, and a plat opened out at 490 feet by the end of March, 1902, and a west cross-cut was commenced in order to intersect the lode. In September, 1903, sinking was resumed, and by November 194 feet was added to the depth of the shaft, and a plat was cut at 670 feet. Work at various levels was proceeded with while shaft-sinking was in progress, and by the end of December, 1904, the whole of the mineral lode above the 660-ft. level to the alluvial was worked out, and the rails removed to the surface. The lode worked varied in character, and showed brown oxidized material in the upper levels, mineralized quartz at a depth, in places, or again quartz with scattered sulphides. The quartz was at times up to 10 ft. in width, and the mineral, which was variable in value with no apparent cause, showed at times a width of 2 ft. 6 in. The average value of the entire tonnage from this shaft was 6.05 dwt. per ton.

*278-ft. Level (274 ft. 2 in. below sill).*—This level was opened out in July, 1902, and the mineral lode, which was oxidized and of a brown colour, was cut at 180 feet from the shaft. Driving south on the lode was commenced, and at 150 feet quartz 4 ft. wide took the place of the mineral up to 240 feet, where driving ceased. Above this level the quartz and mineral lode was stoped to the alluvial. The north drive was carried to a cross-course about 80 feet north of the cross-cut. A drive was put in north at 40 feet west of the shaft to cut the lode on the north side of the cross-course, the displacement being 130 feet. North

of the cross-course the lode consisted of quartz, and the mineral seam was not found above the 380-ft. level north of the break. North of the cross-course the drive broke through to the old alluvial workings (Green Hill gutter).

"Blocking" for 20 feet on either side of the lode gave payable results for a length of over 100 feet. At 435 feet north of the cross-course a strong body of rubbly quartz, with layers of pipe-clay, was met with, and at 495 feet north a full face of quartz, but nothing payable was located beyond 250 feet north of the cross-course, although driving was carried on to 610 feet north of the shaft. The west cross-cut was extended to see if any reef wash had been left by the early miners. A rise was put up at 300 feet west of the north drive, and a cross-cut was opened off it at 42 feet above the level. Wash was struck in this drive, and, being of a hard, cementy character, it was crushed in the battery, 60 tons yielding 6 oz. 16 dwt., after which nothing further was done. A cross-cut was put in easterly at this level. From 240 feet to 270 feet leaders and bunches of quartz were passed through, and at 285 feet the cross-cut was stopped.

390-*ft. Level.*—The cross-cut was cleaned out to 250 feet from the shaft, and a dam was built to prevent the ingress of water from the old alluvial workings. A drive was put in north at 200 feet from the shaft, and at 45 feet the walls were 5 ft. apart, all the material going to the battery. At 74 feet north mineral appeared on the hanging-wall. At 130 feet north a cross-course was met with, carrying 1 ft. of mineral on the south side. The drive north on the quartz, cut at 60 feet from the shaft, carried a formation for 100 feet, at times the full width of the drive. The level was extended, and, after passing through a cross-course, the mineral lode was picked up, being at 30 feet from the cross-course 4 ft. 6 in. wide, which width it maintained for 100 feet before tapering off. At 453 feet north of the cross-cut the mineralized stone pitched underfoot, leaving a track 4 in. wide. At 514 feet north the lode was only 1 ft. wide, but it widened out to 2 ft. 6 in. at 540 feet, and maintained this width up to 656 feet north, or within 50 feet of the boundary of the adjoining mine (the Band and Loch). The lode in the north face split up into two sections—1 ft. of nicely laminated mineralized stone on the hanging-wall, and 2 ft. of quartz on the footwall, with a belt of country intervening.

In the 390-ft. level south the walls of the lode were 4 ft. apart at 16 feet south of the cross-cut, mineral being distributed throughout. At 70 feet the lode had widened out to 9 ft. of highly mineralized stone of good appearance. At 102 feet stone 3 ft. 6 in. wide, showing gold and associated with a mineral seam 1 ft. 6 in. wide, was being driven on. At 140 feet an old reef drive was encountered. From 150 feet to the face at 230 feet the seam was small, ranging from 6 in. to 1 ft. 6 in. wide.

490-*ft. Level.*—At 64 feet west of the shaft 2 ft. of quartz was met with corresponding to the formation 60 feet west of the shaft at the 390-ft. level, and a drive was opened out north and carried through to the cross-course, where the displaced portion of the mineral lode, a black track or leather-jacket, was located. At 270 feet from the cross-cut the lode, being disturbed by a slide, came into the drive. In this level, which was carried to 488 feet north of the cross-cut, 1 ft. 6 in. of mineral was located. A winze was sunk at 40 feet north of the cross-course, and at 30 feet down the lode, with 1 ft. of mineral, was located. The lode had an underlay to the west, and at times payable prospects were obtained, but it was small, and continued so to the 660-ft. level.

600-*ft. Level.*—At this level a cross-cut was put in west 100 feet from the shaft, and from it a north drive for 650 feet.

The following is a record of the gold yields from 1886-1910:—

| Date. | Tons Crushed. | Yield. | | |
|---|---|---|---|---|
| | | oz. | dwt. | gr. |
| 1886 .. .. | 1,796 | 1,723 | 7 | 8 |
| 1887 .. .. | 6,972 | 7,978 | 8 | 0 |
| 1888 .. .. | 4,217 | 4,235 | 0 | 8 |
| 1889 .. .. | 25,993 | 24,032 | 9 | 18 |
| 1890 .. .. | 32,328 | 22,920 | 8 | 6 |
| 1891 .. .. | 117,657 | 72,614 | 7 | 18 |
| 1892 .. .. | 49,772 | 30,792 | 4 | 6 |
| 1893 .. .. | 59,990 | 22,216 | 11 | 0 |
| 1894 .. .. | 48,732 | 16,248 | 4 | 0 |
| 1895 .. .. | 42,962 | 8,353 | 11 | 12 |
| 1896 .. .. | 15,810 | 3,228 | 19 | 6 |
| 1897 .. .. | 19,960 | 5,848 | 2 | 12 |
| 1898 .. .. | 15,966 | 5,087 | 5 | 0 |
| 1899 .. .. | 14,264 | 6,774 | 10 | 12 |
| 1900 .. .. | 10,025 | 3,480 | 2 | 0 |
| 1901 .. .. | 10,208 | 4,275 | 9 | 12 |
| 1903 .. .. | 6,182 | 5,186 | 8 | 4 |
| 1904 .. .. | 9,040 | 2,747 | 17 | 0 |
| 1905 .. .. | 4,490 | 2,061 | 12 | 0 |
| 1906 .. .. | 7,966 | 2,223 | 8 | 0 |
| 1907 .. .. | 4,074 | 2,187 | 0 | 0 |
| 1908 .. .. | 798 | 354 | 0 | 0 |
| 1909 .. .. | 2,962 | 1,410 | 10 | 0 |
| 1910 .. .. | 265 | 159 | 11 | 0 |

The total quantity of quartz crushed was 508,539 tons, which yielded 256,758 oz. 17 dwt. of gold. The total dividends paid amounted to £284,400.

### SOUTH STAR COMPANY.

(Pl. x, xi.)

The company was registered in August, 1886, and commenced to sink the shaft on the 29th September of the same year. The shaft passed through 60 feet of basalt, 5 feet of clay, 104 feet of basalt, and 24 feet of clay, bottoming at 194 feet in slate. At a depth of 238 feet a reef drive of an abandoned alluvial mine was broken into, and the accumulated water from it rose 50 feet in the shaft. Baling failed to reduce the water level, so in May, 1887, another shaft was commenced. This new shaft passed through similar strata to the former shaft, and bottomed at 190 feet, the shaft being quite dry, and the time occupied in sinking four months. Sinking in the bedrock was rapidly accomplished, as by May, 1888, or twelve months after beginning sinking, a plat was cut for the 720-ft. level, and the shaft sinking continued till June, 1891, when a depth of 1,709 feet had been attained, and a plat cut at that depth.

In February, 1893, shaft sinking was resumed, and the shaft was deepened to 1,996 feet (manager's depth 2,000 feet) by February, 1894, when a plat was cut at that depth. In April, 1897, further sinking was commenced, and in September, 1898, the 2,480-ft. (manager's depth 2,500 feet)

level was reached. Sinking then ceased until September, 1905, when it was again resumed, and carried on till December, 1907. By 1907 a total depth of 3,112 feet (manager's depth 3,170 feet) was reached, which at that time constituted the deepest point by over 800 feet in Ballarat. In 1902, when the main shaft had reached a depth of 2,480 feet, an attempt was made to reopen the No. 1 shaft, which had been flooded since 1887. By pumping and baling the shaft was unwatered and cleaned out; the old drive was sunk through, and a well of 30 feet made before cleaning it out. A branch drive to the main shaft was made to connect with the pumps for unwatering. The old drive was cleaned out for 90 feet, when an inburst of water occurred from the alluvial, and, despite pumping and baling, the water-level could not be reduced. A volume of water, estimated at sufficient to cover 1 square mile to a depth of 12 feet, was removed without lowering the water level an inch in the shaft.

### *Structure.*

The prominent feature in the structure of this mine is the large syncline in which the shaft is located. This syncline (the Consols), which is exposed 27 feet west of the shaft at the 720-ft. level and only 28 feet east at the deepest level, shows a uniform pitch of 26° to the south. This pitch coincides with that on the main anticline (the Consols) 800 feet to the east, where worked in the Gay's Band United above the 1,300-ft. level (see p. 134). On the anticline the uppermost bed in the black slate series will cap at about 1,400 feet from the surface east of the main shaft, while in the syncline at the shaft the black slate series will attain a depth of about 3,500 feet. A minor fold shows prominently in the 1,690-ft., 1,896-ft., and 2,235-ft. levels at from 300 feet to 400 feet east of the shaft, but it dies out on the Consols lode below the 2,358-ft. level, the strata in the 2,480-ft. level dipping regularly to the west.

The position of the main anticline in the 2,480-ft. level could not be fixed on account of the cross-cut being closed beyond 740 feet from the shaft. Going west from the main syncline at the shaft a general easterly dip prevails up to a minor fold, which occurs at from 250 feet to 350 feet, followed by another fold at from 740 feet to 800 feet. At 1,048 feet from the shaft in the 720-ft. level the Guiding Star anticline is exposed. This shows an easterly list down to the 1,390-ft. level, where it was found at 970 feet from the shaft. On the west side of the Guiding Star anticline a strong fault dipping to the west occurred, and this displaced the fold, &c., from 50 feet to 80 feet. At 1,192 feet the Guiding Star syncline appeared in the 720-ft. level. This fold is also exposed in the 1,010-ft. level, at a point 50 feet to the west of the blind shaft, and from 1,212 feet from the main shaft in the 1,400-ft. level. General east-dipping strata occur to the face of the 1,400-ft. level 400 feet west of the syncline.

### *Faults.*

Small faults, with but little displacement, are common in this mine, and are of no importance. In the Guiding Star syncline a strong west-dipping fault intersects an easterly dipping one in the vicinity of the Guiding Star lode, and this accounts for the broken state of the country there. In the stopes above the 720-ft. level the lode was displaced 10 feet by an east-dipping fault. Faulting or slipping on the black slate beds is well developed, especially in the Consols lode workings, where slickenslided faces were frequently exposed.

### *The Black Slate Series and the Lodes.*

The black slates, as exposed in this mine, occur on either flank of the Consols syncline, and they probably represent one continuous series around the fold. In the eastern workings the uppermost bed of the series was driven on at the 1,690-ft. level under the impression that it was the Consols lode. This black slate, which appears identical with the Christmas lode in the northern mines, carried a small laminated lode, and was tested down to the 2,235-ft. level. What appears to be a favorable position occurs above the 2,235-ft. level at 400 feet from the shaft, where, by rising 50 feet to 60 feet the trough of the synclinal fold should be met with. At the lowest point reached by mining in the Ballarat field, 3,112 feet below the surface, the Consols lode maintained its laminated mineralized character, but still continued small. For the dimensions of the lode see details of workings at the various levels.

On the western side of the syncline the black slate series occurs at 480 feet to 540 feet from the shaft at the 1,400-ft. level. Here laminated quartz shows on the upper and lower members of the series. In the 720-ft. level the upper slate was driven on at 680 feet from the shaft, the quartz here being from 6 in. to 8 in. in width; the lower slate beds, on account of folding, lie below the 720-ft. level up to a point 882 feet to the west of the shaft. In the synclinal fold, at 800 feet west, a small formation may occur at 50 feet above the level on the upper slate beds. West of the Guiding Star anticline the lower slate beds, dipping to the west, occur at 1,155 feet, the synclinal at 1,193 feet, and the lower slates, with an east-dipping lode 2 feet wide, at 1,241 feet. On the eastern (or west-dipping) leg, the laminated quartz was auriferous, and was stoped above the 720-ft. level south, the reef averaging up to 1 ft. 6 in. in width. North of the cross-cut the lode continued under 1 foot in width. Below the 720-ft. level in the syncline, the legs united, and formed a true inverted saddle. A large fault associated with spurry country continued for some distance, but the main mass of payable quartz was found above the 970-ft. intermediate level.

### *Details of Workings.*

*720-ft. Level.*—The plat was cut at this level in May, 1888, and cross-cutting west was started while the shaft sinking was in progress. At 680 feet from the shaft a lode track, consisting of 6 in. of quartz with pyrites and pug, was intersected, and a drive of 103 feet north was put in along it, without meeting with any improvement in size or value. In March, 1890, this drive was stopped, and work was concentrated in shaft-sinking. In February, 1891, work in the cross-cut was resumed, and good headway was then made in its extension. In July a west-dipping lode formation

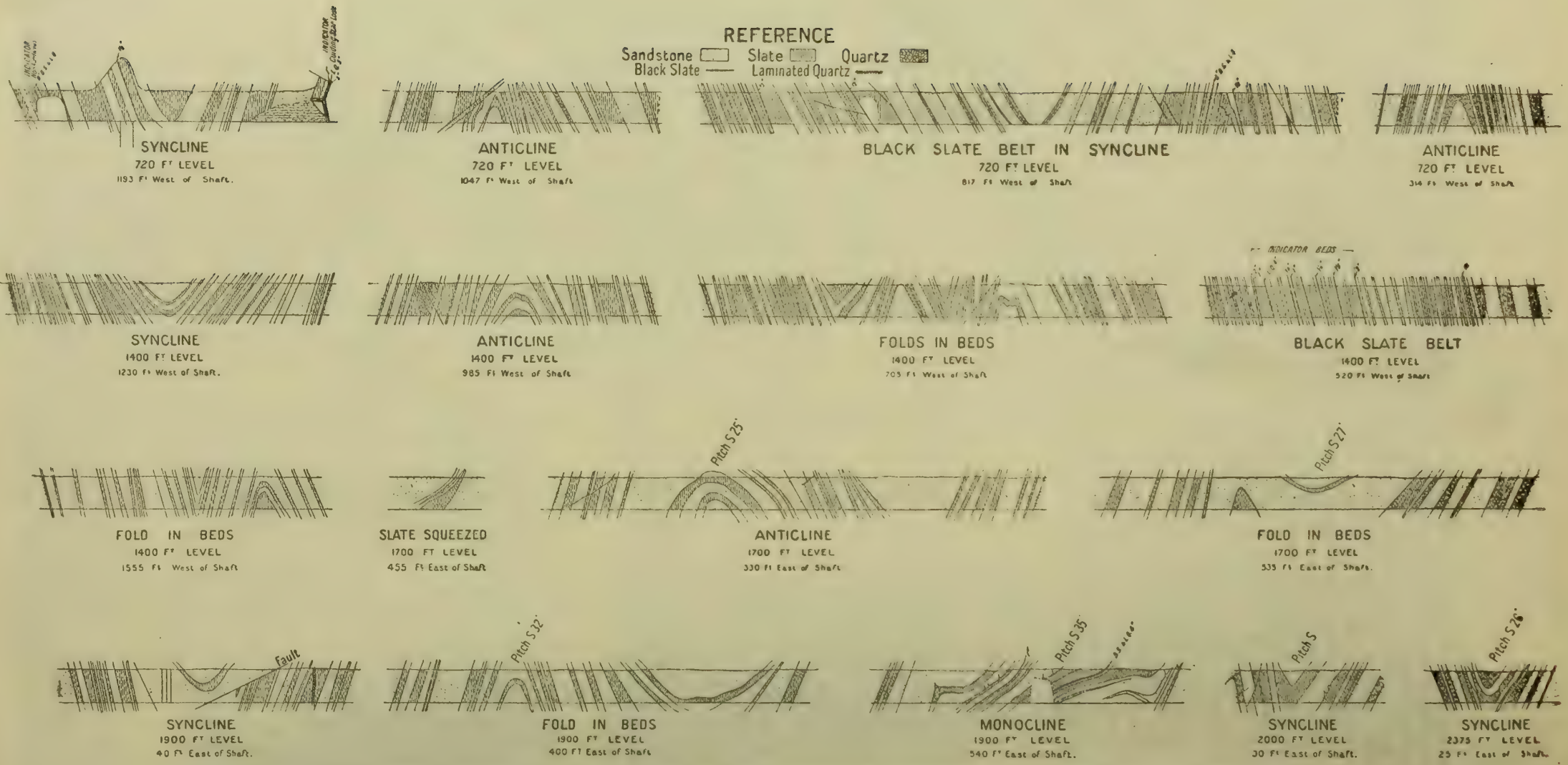



FIG. 31. Sections, South Star Mine, Sebastopol. (The levels shown are the manager's figures.) Scale: 40 feet to 1 inch.

2 ft. 6 in. wide, with from 3 in. to 6 in. of quartz, was met with at 1,155 feet, and at 1,241 feet a lode 4 ft. wide, with 2 ft. of solid quartz dipping to the east, was struck and driven on north for 225 feet. Nothing of value being met with, a drive was started on the west-dipping lode 90 feet nearer the shaft. In the north drive a small lode with black slate, pug, and mineral veins was followed for several hundred feet, but the accompanying quartz, which carried a true wall of black slate, was only from 6 in. to 8 in. in width. In April, 1902, the north drive was repaired for 640 feet, and a rise was put up to test the lode, but nothing payable was located.

Stoping above the 720-ft. level carried a small formation from a few inches to 1 ft. 6 in. wide in the largest part over a length of 1,000 feet by an average height of 100 ft. In the south drive the stone widened out, and at 200 feet was 1 ft. 6 in. wide, continuing so to 250 feet, and showing gold. In June, 1894, a winze or blind shaft was sunk at 1,206 feet west of the main shaft, midway between the eastern and western dipping lodes; 45 feet down the western track, 6 in. of mineralized quartz was struck. At 100 feet below the 720-ft. level a plat was cut on the east side of the blind shaft. At 7 feet east a big make of stone was cut, which consisted of 10 feet of poor stone overlying 3 feet of mineralized stone, on which drives north and south were put in on full faces of quartz. Crushing was now started on this formation, which proved payable.

*Blind Shaft Workings.*

*820-ft. Level.*—A full face of quartz was proved at this level for 300 feet north, followed by a contraction of the lode. At 400 feet the lode was 18 in. wide, and payable. At 700 feet it had narrowed to 10 in. The south drive on the footwall of the lode carried a large formation up to the big crosscourse at 360 feet south of the blind shaft. Rising and stoping above the level connected to the 720-ft. level, and the whole of the footwall stone for a length of 550 feet was taken out.

*870-ft. Level.*—This was at 150 feet in the blind shaft, where drives north and south were opened out in May, 1895, the cross-cut having struck the lode at 25 feet west from the shaft. At this point the reef was 4 ft. 6 in. wide, and showed gold. A full face of stone, showing gold, continued for 400 feet north and south to the crosscourse, veins and spurs on the western wall making a total width of from 20 feet to 30 feet of crushing material.

*910-ft. Level.*—In August, 1895, the 910-ft. level (190 feet in the blind shaft) was opened out, and a large formation was met with. Payable stone was followed for 850 feet north, the drive carrying a full face of stone for the full distance. Near the northern boundary of the lease, the lode contracted to 1 ft. in width. South, at the 910-ft. level, the reef contracted to 3 ft. in width at 70 feet, the stone being highly mineralized; a full face of stone was soon after met with, and was followed to the crosscourse at 400 feet, the stone being of payable quality. South of the crosscourse the lode was found to be displaced 112 feet at this level, but the lode, which was proved to be from 8 ft. to 10 ft. wide at the break, was only 3 ft. in width on the south side. Stopes above the 910-ft. level supplied a large quantity of crushing material from 1896 to 1898.

*1,010-ft. Level.*—At the 1,010-ft. level (290 feet in the blind shaft), no lode was met with in the cross-cut from the foot of the blind shaft to the top of a rise which had been put up from the 1,400-ft. level, at 1,400 feet west of the main shaft, to cut the downward extension of the Guiding Star lode. Owing to the nature of the reef, a trough reef associated with the syncline, operations below the trough at 970 feet proved futile. At 40 feet west of the foot of the blind shaft drives were opened out north and south, and extended to either boundary of the lease under the large formations which were proved in the intermediate level (970-ft.). In the 1,010-ft. level in the north drive the quartz was broken with well mineralized verticals. At 500 feet north, 12 in. of stone carrying gold was intersected. Stoping and winging off the quartz veins parallel to the main lode were carried on over a width of 100 feet at this level, the results generally being unsatisfactory. A parallel drive north and south was started at 140 feet from the blind shaft, and was carried in south for 400 feet and north for 350 feet on flat quartz leaders, which were associated with a large slide.

*1,100-ft. Level.*—At the 1,100-ft. level, 300 feet up the balance shaft or rise from the 1,400-ft. level, a drive north was put in on the slide from the Central Plateau mine, but, although gold was seen at times, the stone was not payable.

*Main Shaft Workings.*

*1,390-ft. Level.*—At the 1,390-ft. (manager's depth 1,400-ft.) level, a cross-cut west was commenced in May, 1890, and by December, 1891, it had reached a point 1,559 feet from the shaft. A north drive was put in at 1,438 feet on a large spurry formation for a total distance of 820 feet, without meeting anything payable, although at times galena and black-jack were visible in the stone. At 650 feet north of the main cross-cut, other cross-cuts east and west were started, and, although nothing of importance was discovered in the east cross-cut, the western one at 40 feet from the north drive cut quartz veins in the country passed through in 1893. In 1901 drives were opened out on these quartz veins, and a trial crushing of 25 tons yielded 15 oz. 14 dwt. of gold. Cross-cuts for these veins were then started at 200 feet and 400 feet south, but, although gold was reported in the veins cut, nothing of value was found except in the most northerly cross-cut workings (the first driven), where a large vein was worked for 16 ft. wide for a total length of 100 feet before it was worked out, a stope over the back having exhausted the formation. At 1,400 feet west of the main shaft a rise was put up to test the supposed downward continuation of the Guiding Star lode, which was then being developed in the blind shaft below the 720-ft. level. This rise was carried up a total height of 390 feet and passed through an occasional flat quartz vein, but nothing of value was met with. At 390 feet up the rise an east cross-cut was started to intersect the cross-cut being driven west from the blind shaft below the 720-ft. level. So exact were the surveys of the manager, Mr. George Fitches, that the two cross-cuts met with practically no error. Such a feat in surveying, considering the changes

of the dip, in the rise, &c., has seldom been excelled. Subsequent to connecting through, some other short cross-cuts were opened out from the rise, and in 1907 an air winch was erected at the 1,100-ft. level, and the rise was converted into a balance shaft while prospecting operations were being conducted at and above the 1,100-ft. level.

*1,690-ft. Level.*—Cross-cutting east for the Consols lode was not begun until a depth of 1,690 feet (manager's depth 1,700 feet) had been attained in June, 1891, as the upper portions of the reef occurred in an adjacent lease, and on its western dip it was assumed to reach this company's area at about this depth. At 790 feet from the shaft a mundic vein was met, and a drive was opened south on a laminated quartz lode from 6 in. to 8 in. wide. At 90 feet south a crosscourse was met with, and a drive was put in south-westerly along it. After driving 50 feet on the crosscourse, which consisted in part of solid pyrites and black slates, what was assumed to be the displaced lode was cut and followed. This proved to be a very tortuous vein, occurring in much broken country, and along it nothing defined was met with in 420 feet of driving south of the crosscourse. North of the cross-cut the drive was put in 50 feet on a lode 4 in. wide, with highly mineralized black slate walls. In the main cross-cut, at 920 feet from the shaft, a crosscourse was met with.

*1,896-ft. Level.*—In September, 1893, cross-cutting east at the 1,896-ft. (manager's depth 1,900-ft.) level was commenced, and the line of lode was cut at 540 feet from the shaft in April of the following year. The lode track, where cut in the cross-cut, carried 6 in. of well mineralized quartz, which occurred in black slate country. Driving north, the lode at 130 feet bulged to 1 ft. 6 in., but it soon pinched, although two good walls 3 ft. apart with 1 ft. of laminated quartz continued up to 200 feet. The lode then became very small, and up to the north face at 673 feet only 3 in. to 4 in. of quartz was met with.

*1,996-ft. Level.*—Cross-cutting east at the 1,996-ft. (manager's depth 2,000-ft.) level was commenced in March, 1894. In August, the footwall of the Guiding Star lode was cut at 486 feet from the shaft, and a north drive was started. A small lode was driven on for 150 feet. At 400 feet broken country was met with, and the drive was turned easterly, a course apparently off the line of the lode. At 750 feet north, an angle cross-cut was put in north-easterly, meeting with a broken lode 2 ft. wide at 870 feet from the cross-cut. This lode was followed northerly, and at 1,050 feet it carried 1 ft. of well mineralized quartz. In the north face, at 1,140 feet, the stone was 1 ft. 6 in. wide. This formation was proved by surveys to be identical with the Consols lode, as worked in the Star of the East Company's mine to the north, and up to this date it was the only work that had been done on the true lode, the 1,690-ft. and 1,896-ft. levels having been driven on the Christmas or western parallel lode. Work at the 1,996-ft. level ceased from February, 1896, till November, 1900, when the north drive was repaired, and the winze sunk at 900 feet north on the Consols lode, near to the point of intersection by the angle cross-cut. A lode formation the full width of the winze was sunk on for 90 feet, then 1 foot of quartz came in, and continued until the winze, at a depth of 150 feet, was holed through to the rise from the 2,250-ft. level in 1901.

*2,235-ft. Level.*—The 2,235-ft (manager's depth 2,250-ft.) level was opened out in December, 1897, and what was taken to be the Consols lode was met with at 310 feet from the shaft, and here a drive was put in northerly. Well mineralized quartz was driven on for a distance of 350 feet. The lode was small, and seldom up to 9 in. in width, but at 120 feet it was reported as gold-bearing on each wall. A north-easterly drive was started from the north face on the lode in January, 1889, and at 200 feet a mineralized lode track in black slate was passed through. The angle drive was continued to 300 feet, and then turned northerly for 180 feet. An adjoining company (Gay's Star) obtained permission to extend a cross-cut into their ground from this level, but stopped work after 130 feet of cross-cutting had been done. In June, 1900, driving north was begun on the lode track cut at 200 feet from the north drive. This lode track, at 14 feet north, was 6 ft. wide, with 1 ft. of laminated stone, which gave fair prospects of gold. At 130 feet the formation was 7 ft. wide, and consisted of quartz leaders and laminated quartz, the latter being 1 ft. 6 in. wide. At 200 feet north the formation had widened out to 10 ft., and gold could be seen in the solid quartz. At 250 feet the lode was 12 ft. wide, and a trial crushing from the lode up to this point gave 27 oz. from 53 tons. The lode then tapered off, and continued from 2 ft. to 3 ft. wide to the north face, the quartz being of poor quality. At a point 300 feet along this north drive a rise was started to connect with the winze from the 2,000-feet north drive. For 80 feet a full width of stone was risen through, but this tapered off before holing through. At 70 feet up this rise, an intermediate level north and south was opened out. A large body of stone was driven on to the north for 50 feet, from which fair prospects of gold were obtained, and to the south the drive carried 7 ft. of poor stone for 25 feet.

*2,358-ft. Level.*—At the 2,358-ft. (manager's depth 2,375 ft.) level the lode was cut at 410 feet east of the shaft in June, 1900, the formation being 3 ft. wide, with 8 in. of laminated quartz on the footwall. Driving north, the walls separated, and at 100 feet they were 12 ft. apart with 3 ft. of well mineralized stone on the footwall. This stone continued to 400 feet. At 600 feet a new shoot of quartz 4 ft. wide, carrying a little gold, was met with, the two formations now being over 7 ft. wide; this formation increased in size until it reached from wall to wall, being 8 ft. wide in the north face at 750 feet, but it was not payable.

*2,480-ft. Level.*—The east cross-cut at the 2,480-ft. (manager's depth 2,500 ft.) level started in September, 1898, was the deepest then in Ballarat. At 190 feet a lode formation, believed to be the Christmas lode, was intersected. At 350 feet a formation—the Consols lode—consisting of 3 ft. of laminated quartz and black mineralized slate, was passed through. At 883 feet the cross-cut met with a new track, which had not hitherto been noticed in the Ballarat West mines. A drive north on the formation cut at 350 feet from the shaft proved the lode walls to be 2 ft. apart, with only a little quartz. This track continued small, but well defined, for 300 feet, when an improvement

occurred, well mineralized stone making on the wall. At 430 feet the footwall stone was 2 ft. 6 in. wide, and well mineralized and laminated, but no payable stone was met with in the level up to the face within 200 feet of the northern boundary.

Four rises were put up above this level, one (the No. 1) connecting with the winze from the 2,358-ft. level, without meeting anything payable, although a well defined lode track was conspicuous throughout. At 350 feet in the north drive, a cross-cut was put out westerly for 50 feet, cutting the western track, which was here 8 in. wide and well mineralized. A south drive opposite to the north drive was started in 1900, and this carried a shoot of gold-bearing stone 2 ft. wide for a length of 40 feet, but a rise put up above the back proved that the formation did not extend in that direction.

*2,718-ft. Level.*—The north drive on the track of the lode at the 2,718-ft. (manager's depth 2,750 ft.) level was commenced in June, 1908, at 75 feet east of the shaft. Here the formation varied from 3 ft. when first cut to 2 ft. at 200 feet, where it carried fair gold. At 400 feet the formation was small.

*3,052-ft. Level.*—At the 3,052-ft. (manager's depth 3,100 ft.) level in 1907-1908, a lode formation with from 1 ft. to 1 ft. 6 in. of laminated quartz on the footwall and quartz veins across to the hanging wall was driven on for a length of 350 feet. At 300 feet north a little gold was seen in the stone of this formation, which was up to 20 ft. in width.

*3,112-ft. Level.*—At the 3,112-ft. (manager's depth 3,170 ft.) level the lode was cut at 70 feet east of the shaft early in 1908, and a connexion was made from the north drive to the winze from the 3,052-ft. level. Owing to excessive heat and heavy cost of working, the north drive was discontinued at 90 feet. Soon afterwards the company ceased operations, and the plant was sold and removed. Thus the deepest mining at Sebastopol was suspended.

Gold Yields.

| Date. | Ore Crushed. | Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1893 .. .. | 1,082 | 479 | 13 | 2 |
| 1894 .. .. | 888 | 367 | 7 | 2 |
| 1895 .. .. | 12,367 | 6,209 | 11 | 12 |
| 1896 .. .. | 26,244 | 14,169 | 13 | 18 |
| 1897 .. .. | 30,243 | 14,073 | 2 | 19 |
| 1898 .. .. | 30,085 | 9,612 | 15 | 10 |
| 1899 .. .. | 22,194 | 8,895 | 17 | 18 |
| 1900 .. .. | .. | 6,276 | 17 | 0 |
| 1901 .. .. | .. | 1,582 | 16 | 0 |
| 1902 (2 quarters) | .. | 499 | 17 | 0 |
| 1906 .. .. | 2,065 | 853 | 0 | 0 |
| 1907 .. .. | 6,650 | 1,989 | 0 | 0 |
| 1908 .. .. | 710 | 190 | 15 | 0 |

Up to the end of December, 1901, when regular crushing ceased, the total gold yield amounted to 60,911 oz. 15 dwt., from which dividends amounting to £26,400 were paid. The total gold yield, so far as recorded, was 64,444 oz. 7 dwt.

CENTRAL PLATEAU COMPANY.

(Pl. xii, xiii.)

*Historical.*

The Central Plateau Company was formed in 1886, and a start was made to sink the shaft early in 1887. The strata passed through were:—

| Formation. | Thickness. |
|---|---|
| | feet. |
| First rock (basalt) .. .. | 82 |
| Clay .. .. .. | 11 |
| Second rock (basalt) .. .. | 94 |
| Clay .. .. .. | 11 |
| Third Rock (basalt) .. .. | 40 |
| Reef wash .. .. .. | 3 (fair prospect of gold) |

Considerable trouble was experienced in the shaft-sinking at the base of the second rock. The shaft bottomed at 241 feet.

By November, 1889, cross-cutting at the 594-ft. level was commenced, and shaft-sinking was continued until early in 1892, when a depth of 1,000 feet was reached. At 751 feet, 849 feet, and 960 feet in the shaft levels were opened out to the west. During 1892, owing to a general depression in the mining and financial markets, operations were suspended, and were not resumed until September, 1893, when the water was baled out and a start was made to drive north on a formation which was thought to be identical with that then being worked in the South Star mine adjoining. In November, 1893, operations were again suspended, but in January, 1895, work was resumed owing to the prospects in the South Star mine having improved. The mine was unwatered to the bottom level, and the extension westerly of the 968-ft. level cross-cut was commenced early in February of that year.

In 1896 the South Star mine, having opened up large bodies of payable ore extending towards the Central Plateau Company's boundary, operations in the direction of this belt of country were vigorously pushed on with at the 968-ft. and 849-ft. levels, with the result that by September, 1896, payable ore had been located. Crushing was now commenced, and for the half-year ending April, 1897, 11,880 tons had been treated for a yield of 7,229 oz. 6 dwt. 12 gr. of gold, valued at £30,002 14s. 4d., and out of which five dividends, amounting to £8,750, were paid, as well as £750 prospecting loan returned to the Government.

During 1897, the shaft was sunk to a total depth of 1,108 feet, and a plat was cut at 1,087 feet from the surface. In 1898 four dividends of 1s. each per share, amounting to £5,000, were paid, besides £600 of the prospecting loan returned to the Government. Notwithstanding a good aver-

age value of the ore crushed, recourse to calls had to be made during the middle of the same year. Prospecting operations were continued, but failed to locate new ore bodies, and early in 1899 the large formations were exhausted, causing the gold return to fall to under 80 oz. for the half-year ending October, 1899. Spurs to the west of the main lode yielded crushing material during 1900. The cost of carting and crushing at neighbouring batteries then being considerable, a 20-head iron-framed battery was erected near to the shaft, where crushing commenced in April, 1901. Returns from the new battery were not as satisfactory as expected, as the value of the stone left in the earlier stopes was of low-grade, but crushing continued with interruptions until the suspension of the work at the No. 1 shaft in 1909. Shortly afterwards a start was made to sink a new shaft (No. 2) some distance to the west to prospect the Albion line of lode, but without success.

*Structure.*

The geological structure in this mine is more complicated than that in any of the other mines of the Sebastopol Plateau. The strata are crumpled into numerous and acute folds which usually pitch at high angles, and the beds are often divergent in strike; moreover the strata are broken, disturbed and crushed by numerous faults. To add to the difficulties of interpretation, the direction of the crosscuts is not at right angles to the axes of the folds, but in various other directions which have been necessitated during mining operations by the broken nature of the country.

Correlating the features with the mines situated to the north, the Consols syncline is located at 500 feet to 600 feet to the east of the shaft, while the Albion anticline, the main anticline of this portion of the field, lies to the west of the present cross-cuts, but was probably intersected in the cross-cut off the south drive, which, owing to accumulated gas, was never available for survey. The various cross-cuts show the structure between the Albion anticline and the Consols syncline to consist of a highly corrugated series of beds, with the Guiding Star syncline represented by a minor fold in the general east-dipping beds, while larger synclines have developed further to the west. A decided easterly list of the axis of the folds is noticeable throughout. With the exception of the Guiding Star syncline, which pitches to the north, the pitch of the folds is to the south at angles up to 24°. The black slate series, much faulted by slides, &c., is met with at from 120 feet to 190 feet from the shaft, at the 968-ft. level. A trace of the higher beds in the series was noticed on the anticline at 75 feet, but the country is there much disturbed. At the 849-ft. level the black slates occur on either side of a fold at 270 feet from the shaft. This fold repeats the beds, but is not sufficient to show the same at the lower level. In a syncline at 435 feet from the shaft the black slates, after rising over the anticline at 370 feet from the shaft, again occur at the 849-ft. level, and also show at the 968-ft. level, on either side of the syncline. On rising over the next anticline to the west (the Guiding Star anticline), the black slates, here carrying a laminated lode, were met with in the workings above the 849-ft. level north, and a rise was subsequently put up above the main cross-cut at 600 feet from the shaft, meeting with a laminated trough reef at 36 feet above the level. This portion of the reef was small and not payable. At the 1,087-ft. level the black slates, here dipping east, are only exposed at 45 feet to 125 feet from the shaft.

The faults in this mine may be divided into slide faults and cross-courses. The slides are represented by pug-seams occurring along the bedding planes at numerous places. Faults intersecting the strata at all angles are also frequent, the amount of displacement being small. These faults dip to the east and west, and appear to be directly associated with the folds, as it is noticeable that in east-dipping beds the faults dip westerly, while in west-dipping beds they dip to the east. No continuous faults of the leather-jacket type were visible. Of the cross-course series, the most prominent is one along which the 849-ft. and 969-ft. level north drives were put in.

The quartz formations, as worked, were confined to the Guiding Star line of lode. Cross-cutting from the shaft at the 849-ft. and 968-ft. levels, failed to intersect the lode. Drives were put in northerly along a cross-course or break striking north-easterly, and at 320 feet from the cross-cut a lode 10 ft. to 12 ft. wide was met with at the 849-ft. level. Rises above this level proved the structure of the reef to be similar to that in the adjacent mine, the South Star, as at 100 feet above the 849-ft. level the lode was laminated and under 1 ft. wide, coinciding in strike and dip with the strata.

Under the 849-ft. level a large flat slide (of the leather-jacket type) was met with, below which the auriferous stone was irregular, only quartz spurs being located. The true nature of the auriferous lode was an inverted saddle or trough formation, which character was apparent throughout. Following southerly from the large formation, the trough of the syncline was met with pitching to the north, and subsequent workings proved that the main cross-cut had passed below the lode, which, in this direction, was small, so little prospecting was carried out.

In the south drive, at the 849-ft. level, a flat quartz spur yielded numerous well-shaped gold crystals, but the stone was unprofitable. The extension of this south drive, which was not open for survey, appears to have been too deep for the Guiding Star formation, and also not far enough east to locate anything on the Phœnix syncline, which carried an auriferous formation at 450 feet east of the shaft in the Sebastopol Plateau No. 1 mine.

*Plans and Sections.*

*Transverse Section.*—Owing to the cross-cuts not being at right angles to the general strike of the strata, and also not maintaining a general course, the section as shown is a projection on a mean average east and west line. The section shows all the workings available for survey at that time (Pl. xii.).

*Plan—Detail Plan of Workings.*—Owing to the inaccessibility of many of the drives, this plan is mainly a copy of the mine manager's work (Pl. xiii.).

*Details of Workings.*

The cross-cut east at the 594-ft. level was opened out in November, 1889. At 278 feet from the shaft a cross-course was met with, on which, at 30 feet from the point of intersection, two slides 2½ feet apart, with a little quartz in each, were driven on for 25 feet. At first this was supposed to be the Guiding Star line of lode.

West from the shaft the cross-cut, at the 751-ft. level, was commenced in March, 1890, and in October of that year a formation of quartz and slate, containing a good deal of mineral, was cut at 250 feet from the shaft. Driving north and south was started, the north drive for 90 feet carrying a body of stone from 2 ft. to 4 ft. wide. At a point 70 feet north of the cross-cut a rise was put up 22 feet on the lode, which was 3 ft. wide. Southwards a drive of 156 feet proved that the lode was mineralized, and from 2 ft. to 5 ft. wide, but of no value.

The 849-ft. level west cross-cut commenced early in 1891, met with a large slide at 350 feet from the shaft, and was continued to 529 feet. Driving north and south was started on a track at 265 feet from the shaft. This track widened out as driven on to the north, and at a distance of 126 feet from the cross-cut it was 3 ft. 6 in. wide. South at 32 feet quartz 9 in. wide occurred in the lode track. Work ceased at this point owing to the closing down of the mine early in 1892, and for several years little work was carried on.

Driving on the lode at the 751-ft. level was commenced, but after 30 feet of driving on well-mineralized stone 1 ft. wide, and rising up 55 feet without obtaining payable results, this level was abandoned. In June, 1895, the cross-cut at the 849-ft. level was re-started, as the surveys of the adjacent mine (the South Star) showed that their lode lay further to the west. With the extension of this cross-cut the water increased to 5,460 gallons per hour. Early in 1896 a cross-course was met with in the 848-ft. level, and a drive turned north-easterly along its course towards the South Star Company's mine. On the cross-course several quartz leaders, carrying gold, were passed through, the lode formation being over 30 ft. in width. In September, 1896, driving north along the line intersected a payable shoot, the lode here varying from 8 ft. to 30 ft. wide. Good crushings, from which dividends were paid early in 1897, were obtained from the 849-ft. level north drive and its stopes. The north drive, at the 968-ft. level, had meanwhile been extended to beneath this payable stone, and rises were put through and some intermediate levels opened up. During 1897 the shaft was deepened, and a west cross-cut was started at the 1,087-ft. level. Prospecting works were also taken in hand at the 751-ft. level from a rise above the 849-ft. level. During October, 1898, the value of the quartz in the stopes fell away, and during the succeeding half-year the gold return fell from 3,346 oz. 8 dwt. 14 gr. to 66 oz. 11 dwt. 5 gr.

The company had prior to this crushed at the Star of the East battery, but, as it was supposed that much low-grade stone was still left, a contract was let in 1900 to erect a battery of their own, which was completed during March, 1901. Ore of fair value, though of limited extent, was operated on for over twelve months, and calls were necessary to carry on the prospecting work, which, during 1902, was confined to the 968-ft., 849-ft., 594-ft., and 377-ft. levels. No work had been carried out at the 1,087-ft. level since April, 1901, and all material from the 968-ft. and 849-ft. levels was withdrawn during 1903 as a consequence of the flooding of the South Star workings owing to the cessation of pumping in that mine.

Operations were now directed to the 594-ft. level, where, during the latter part of 1903, cross-cutting, both to the east and west, was undertaken. A start was also made at this time to re-open an old alluvial shaft known as the Red Jacket, within the company's lease, with the object of prospecting the lines of reef which had been met with while working the alluvial in the sixties, one to the east and the other to the west of the shaft. After some trouble the site of the old shaft was located and cut down. At 241 feet water level was struck, and a level was opened out to the east at 208 feet, and another to the west at 241 feet from the surface. Owing to the prospecting works not meeting with success, and to litigation with the adjacent mines over pumping, all work at this shaft and the main shaft was suspended early in 1904. Subsequently, in 1905, work was only resumed at the main shaft, the supposed lines of reef in the Red Jacket not having been reached.

In the main shaft, after the water difficulty had been adjusted and the mine drained, the carbonic acid gas in the workings prevented for some time any work at the lower or 1,087-ft. level, but after overcoming this difficulty the north drive was extended towards the South Star ground. Work at the 968-ft. level was confined to sinking a winze in order to connect with the 1,087-ft. level and to test a block of quartz going underfoot in the upper level. During 1906 several rises were put up, and an intermediate level was opened above the 1,087-ft. level, from which quartz of fair value was obtained. Under agreement between the companies the South Star Company extended the 1,087-ft. level into their ground in 1906. In the stopes above the 1,087-ft. level quartz spurs and veins were mined and crushed, but the returns failed to pay the working expenses of the mine. Prospecting at the 968-ft. level was also carried on till March, 1909, when all material was removed from the levels and work at the main shaft ceased.

A Government grant having been obtained by the company to assist in developing the western portion of the claim, boring was commenced in 1909 with a view to selecting a site for a new shaft. After two bores were unsuccessful a third

one located shallow ground, on which the No. 2 shaft was commenced in September, 1909. A complete winding plant was erected, but owing to a general depression in mining at Sebastopol, work was suspended until February, 1911, at which date the shaft was 98 feet deep. Shaft-sinking was resumed, and a depth of 594 feet was reached in October, 1911, and in February, 1912, an eastern cross-cut was then put out cutting the Albion lode belt of country at 280 feet, with the footwall at 360 feet, where a lode track, much disturbed by a slide, was followed north. At 124 feet north the lode became solid, and carried a few colours of gold. At 300 feet the lode had increased to over 15 ft. in width, and consisted of a stockwerke of quartz veins in crushed slate, resting on a laminated lode from 6 in. to 2 ft. wide, inter-laminated with black slate. Taking the stone for an average width of 10 ft. from a length of 300 feet and an average height of 15 feet, it produced a gold yield of nearly ½ oz. to the ton. At 50 feet above the drive the bulk of the quartz cut out. Drives were put in south 85 feet and 158 feet on the footwall tracks, but nothing of value was met with.

The shaft having been sunk, a cross-cut east was opened out at a depth of 751 feet. The western edge of the black slate zone was met with at 240 feet from the shaft, and the eastern edge at 340 feet, on both of which the lode tracks were small. On the eastern track a drive was put in to a cross-course at 580 feet north without locating quartz of any size or value. A rise over the level connected with the formation worked at the 594-ft. level, which was proved to continue without profitable values to within 30 feet of the 751-ft. level. North of the cross-course the black slate zone was passed through by a diagonal cross-cut; the western and middle tracks were small, ranging from 1 inch up to 6 inches of crushed slate and quartz; the footwall track consisted of 1 foot of pug with some small quartz, along which the drive was put in north for a distance of 100 feet without change. A drive was put in south from the main cross-cut along the main track, as driven on north, for a distance of 80 feet without meeting any quartz.

In 1915 the shaft was deepened, and a cross-cut was put in east at a depth of 900 feet below the surface. At 180 feet the western or No. 2 track was cut, and at 270 feet the eastern or main track. On the latter a drive north was put in 285 feet, and passed through a small cross-course. The track varied from a trace up to 12 in. wide of pug and laminated quartz. At 100 feet north a rise was put up 69 feet, meeting quartz 3 ft. wide at 50 feet, 9 inches of the footwall stone being laminated. A drive south from the main cross-cut was put in 120 ft. on the same track, which consisted of black slate and quartz veins. At 180 feet from the shaft the track, where cut in the cross-cut, was from 8 in. to 1 ft. 6 in. wide, and consisted chiefly of laminated quartz, which carried gold and pyrites. Northwards the quartz increased in size for a length of 30 feet before it tapered. At 160 feet a small cross-course displaced the lode 10 feet to the north-east. At 530 feet the large cross-course was met, and the drive turned easterly, intersecting on the south side of the cross-course the footwall slates, on which the quartz was small and of no value. The drive was then turned north from the footwall slates, and the hanging-wall slates were located to the north of the cross-course. At 135 feet from where located, the lode increased to 2 ft. wide of laminated quartz, carrying payable gold for a length of 15 feet, after which it tapered off to a track. At 200 ft. north a cross-cut east was put in across the black slate belt, but the tracks were small and valueless, and so work was concentrated on the north drive, which was extended to 1,200 feet.

North of the make of quartz in the north drive a rise was put up to a height of 50 feet, passing through the shoot of quartz, which was again met with in a drive north at the top of the rise. The shoot of quartz in this level was about 5 ft. wide in the back of the drive, and it tapered to 4 ft. wide in the floor of the level. It consisted of two white bodies of quartz with laminated quartz on the footwall carrying gold values.

South from the main cross-cut the No. 2 track was followed for 200 feet, the wall being continuous to a cross-course at that distance. South of the cross-course the drive was turned south easterly, but nothing of value was located, nor was the amount of displacement of the fault established.

*Structure of No. 2 Shaft* (Pl. xiii.).

An examination of the workings of this shaft reveals the fact that the shaft is located on the western edge of a synclinal fold, which shows in the plats on the east side of the shaft. Throughout the cross-cuts only west-dipping strata are exposed. The black slate zone, in which the Albion or Prince of Wales lode occurs, shows in the three cross-cuts with a general westerly dip of 30 feet in 100 feet, which will allow the hanging-wall or No. 2 track to meet the syncline at about 1,500 feet below the surface, while the footwall or main track will reach the syncline about 300 feet lower. Between these two tracks, which lie about 100 feet apart, there are several black slates and pug tracks, of which the chief quartz-bearing one is about 12 ft. west of the footwall track, and consists of brecciated quartz from 4 in. to 12 in. wide. Along the black slates which form the footwall and hanging-wall lodes, small laminated quartz lodes occur, and, though small, are remarkably continuous. With the exception of a large blow of quartz on the footwall lode above and below the 600-ft. level, the quartz occurrences in this mine have been disappointing, but it would appear from the increase in size of the No. 2 track, which, at 750-ft. level, was only 2 in. wide, and at the 900-ft. level over 1 ft. wide for a length of 500 feet, that in depth an improvement in size may be expected. This was proved to be the case in the Star of the East Company's No. 2 shaft workings on the Albion lode, half-a-mile further to the north (see p. 180).

*Gold Returns.*

| Year. | Ore Crushed. | Yield. | Dividends. | Calls. | Remarks. |
|---|---|---|---|---|---|
| | tons. | oz. dwt. gr. | s. d. | s. d. | |
| 1896 | 302 | 190 14 0 | .. | 3 0 | 1 quarter |
| 1897 | 20,261 | 10,655 15 6 | 7 0 | .. | 2 quarters. Value of gold, £14,222 6s. 9d. |
| 1898 | 19,588 | 8,213 16 8 | 4 0 | 1 0 | 2 quarters. Value of gold, £34,093 10s. 10d. |
| 1899 | .. | 146 10 5 | .. | 6 6 | 2 quarters. Value of gold, £607 10s. 1d. |
| 1900 | 7,277 | 2,545 19 23 | .. | 4 0 | 2 quarters. Value of gold, £10,579 14s. 8d. |
| 1901 | 6,230 | 2,244 5 0 | .. | 4 6 | 2 quarters. Value of gold, £9,290 8s. 1d. |
| 1902 | 2,325 | 906 0 6 | .. | 5 5 | 2 quarters. Value of gold, £3,747 5s. 6d. |
| 1903 | 250 | 47 17 18 | .. | 5 4 | 1 quarter. Value of gold, £199. |
| 1905 | 120 | 46 18 0 | .. | 1 7 | 1 quarter. Value of gold, £186 9s. 10d. |
| 1906 | 4,743 | 1,714 14 6 | .. | 2 7 | 2 quarters. Value of gold, £7,080 4s. 3d. |
| 1907 | Pyrites | 14 9 2 | .. | .. | .. |
| 1907 | 6,171 | 1,923 1 6 | .. | 0 6 | 2 quarters. Value of gold, £11,538 7s. |
| 1908 | 5,010 | 1,705 12 18 | .. | 4 2 | 2 quarters. Value of gold, £7,597 3s. 6d. |
| 1909 | 1,682 | 481 9 12 | .. | 0 6 | 1 quarter. Value of gold, £1,995 17s. |
| 1910 | .. | .. | .. | .. | .. |
| 1911 | .. | .. | .. | .. | .. |
| 1912 | 1,725 | 776 1 0 | .. | .. | Albion Lode, No. 2 Shaft, 600-ft. level |
| 1913 | 3,599 | 1,116 6 0 | .. | .. | .. .. |
| 1914 | 7,613 | 2,074 0 0 | .. | .. | .. |
| 1915 | .. | .. | .. | .. | .. |
| 1916 | .. | .. | .. | .. | .. |

The total output from the lease to the end of September, 1917, amounted to 34,789 oz., obtained from 87,197 tons of ore crushed. To the same date, capital called up amounted to £102,811, and Government grants to £4,927, while wages absorbed £116,768; contract labour, £30,628; fuel, £26,905; ironmongery, £13,681; the total expenditure for a period of 31 years amounting to £261,260, of which only £13,750 was paid in dividends.

NORTH CENTRAL PLATEAU COMPANY.

(Pl. XIV.)

This company was formed towards the end of 1912, and it secured the northern portion of the Central Plateau Company's lease, on which boring for a shaft site was then commenced. This course was necessary on account of the proximity of the deep lead workings. Three bores were put down, passing through strata as under:—

| No. 1 Bore. | Thickness. |
|---|---|
| | feet. |
| Clay .. .. .. .. | 8 |
| Basalt .. .. .. .. | 86 |
| Clay .. .. .. .. | 11 |
| Basalt .. .. .. .. | 102 |
| Clay .. .. .. .. | 14 |
| Basalt .. .. .. .. | 71 |
| Stopped at .. .. .. .. | 292 |

NORTH CENTRAL PLATEAU COMPANY—*continued.*

| No. 2 Bore. | Thickness. |
|---|---|
| | feet. |
| Clay .. .. .. .. | 4 |
| Basalt .. .. .. .. | 84 |
| Sand .. .. .. .. | 1 |
| Basalt .. .. .. .. | 12 |
| Clay .. .. .. .. | 21 |
| Basalt .. .. .. .. | 88 |
| Clay .. .. .. .. | 14 |
| Basalt .. .. .. .. | 83 |
| Clay .. .. .. .. | 13 |
| Wash .. .. .. .. | 3 |
| Bottomed at .. .. .. | 323 |

| No. 3 Bore. | Thickness. |
|---|---|
| | feet. |
| Clay .. .. .. .. | 5 |
| Basalt .. .. .. .. | 83 |
| Clay .. .. .. .. | 15 |
| Basalt .. .. .. .. | 2 |
| Clay .. .. .. .. | 14 |
| Basalt .. .. .. .. | 89 |
| Clay .. .. .. .. | 12 |
| Basalt .. .. .. .. | 95 |
| Drift .. .. .. .. | 3 |
| Wash .. .. .. .. | 3 |
| Bottomed at .. .. .. | 321 |

At 88 feet from the surface water was struck in the bores. In No. 2 bore, when a depth of 274 feet was reached, the water fell from 88 feet to 192 feet from the surface, and stood at this level when the bore was completed. In No. 3 bore, the first water was struck at 88 feet, with more at 208 feet and 255 feet, and the level was 188 feet from the surface on completion of the bore. A shaft site was decided on at No. 1 bore, and sinking commenced towards the middle of 1913. With the bore hole in the shaft a marked phenomenon was present with the varying atmospheric pressure, at times a strong current of air rushing into the bore hole, and again a strong blast of carbonic acid gas blowing out. At 88 feet water-level was reached, and a plant was erected to cope with the water. Operations were then suspended.

CENTRAL PLATEAU EXTENDED COMPANY.

(Pl. XIV.)

This company was formed early in 1913, and in February commenced shaft sinking for the Albion lode at a site west of Pleasant-street, between Lonsdale and Cobden streets. The strata passed through in the shaft, before reaching the bedrock at 146 feet, consisted of:—

| Formation. | Thickness. |
|---|---|
| | ft. in. |
| Surface loam .. .. .. | 1 6 |
| Clay, with ironstone nodules .. .. | 2 3 |
| Clay .. .. .. .. | 2 9 |
| Decomposed basalt .. .. .. | 3 6 |
| Basalt (first rock) .. .. .. | 96 6 |
| Sandy clay .. .. .. .. | 5 0 |
| Cement and gravel .. .. .. | 5 0 |
| Compact sand, &c. (false bottom) .. | 4 0 |
| Sandy basaltic clay .. .. .. | 5 0 |
| Loose gravel .. .. .. .. | 1 0 |
| Basaltic clay .. .. .. | 2 0 |
| Very hard basalt (second rock) .. .. | 11 0 |
| Cement .. .. .. .. | 6 6 |

Below the base of the first rock the water was found to be heavy, and a double horse whip proved to be inadequate for coping with it. A steam winch plant was erected, and the shaft puddled up from a frame set in the clay below the

rock. Owing, as ascertained afterwards, to a large basalt boulder extending through the clay to the gravel below, the water behind the puddling found an entrance into the shaft, consequently another frame was set at 116 feet 6 inches from the surface on what was regarded as bedrock. This proved to be a false bottom, and the puddling broke away in the south end of the shaft owing to the soft nature of the stratum, and the water came into the shaft 6 feet below the frame. On further sinking the shaft a third frame was set in the basaltic clay at 128 feet 6 inches, and the shaft puddled up, resulting in an absolutely dry shaft being obtained. (For an account of the method of puddling up this shaft see p. 66). The sinking in the bedrock proved that the strata were west-dipping, at times highly mineralized, and cut by quartz spurs. At 500 feet from the surface a large formation, consisting of honeycomb quartz with some decomposed felspar, pyrites, and occasionally galena was struck and sunk on to 545 ft., where it passed out of the shaft on its western underlie. Fine gold was at times visible in this quartz. A depth of 600 feet was reached, and cross-cutting east and west was commenced at 597 feet below the surface. At 22 feet east of the shaft an anticline, the existence of which was not expected, was met with, and the cross-cut east to 250 feet from the shaft passed through east-dipping beds stratigraphically higher than the black slate zone, while the west cross-cut intersected similar beds on the western dip. At 35 feet west of the shaft a spurry formation was cut, and a drive was put in southerly along the track.

### SEBASTOPOL PLATEAU NO. 1 COMPANY.

(Pl. XV., XVI.)

The Sebastopol Plateau No. 1 Company was formed in 1886, and shaft-sinking was commenced towards the end of that year. The shaft bottomed on high reef at a depth of 92 feet. Early in 1890 operations at the 200-ft. level included an eastern cross-cut of 266 feet. This passed through several flat leaders and blows of quartz, but nothing payable was disclosed. At the same time, at the 563-ft. level, an eastern cross-cut was put in, and driving from the western cross-cut was also carried on for 31 feet. Before the end of the year a winze was sunk to a depth of 21 feet below the 556-ft. level, and the sinking of the main shaft was resumed. By the beginning of 1891 the main shaft had reached a depth of over 800 feet. Cross-cutting at the 645-ft. and 800-ft. levels was begun before the close of 1890, but nothing payable was disclosed. In 1891 the shaft had reached a depth of 1,000 feet, where a plat was cut. The west cross-cut, at the 800-ft. level, intersected, at 153 feet from the shaft, a formation reported to be a lode 1 ft. 6 in. wide carrying gold, black-jack and galena; and on this drives to the north and south were started.

During 1892, owing to the financial crisis, work at the mine ceased, but towards the end of the year the allocation of a Government grant to the company enabled operations to be resumed at the 800-ft. and 900-ft. levels. The north drive, at the 800-ft. level, was extended to 236 feet from the cross-cut on a lode, which varied from 1 ft. to 2 ft. wide and carried minerals. Cross-cutting east at 75 feet north of the main cross-cut passed through strata with quartz spurs for a total width of 20 ft., while west, at 110 feet north of the cross-cut, the formation was proved for over 12 ft. wide. At the 900-ft. level the cross-cut was put in 82 feet by March, 1893, and by the end of the year it had reached 156 feet from the shaft. The north drive at the 800-ft. level was stopped at 330 feet from the cross-cut, and a winze was sunk to connect with the 900-ft. level.

Early in 1894 the 900-ft. level cross-cut was extended to 323 feet from the shaft, passing through a lode track at 285 feet, with quartz from 2½ ft. to 3 ft. wide, which carried minerals and a little fine gold. On this formation north and south drives were put in 27 feet and 23 feet respectively on what was regarded as the footwall, coarse gold being found in dish prospects. By the end of 1894 a drive was started on what was taken to be the hanging-wall of the formation, and proved a large body of highly-mineralized quartz, with occasionally a little gold. A drive south, also on the same track, carried a promising formation for a distance of 85 feet. Financial difficulties arose, and mining generally on the Sebastopol Plateau became dull, and all work ceased towards the close of 1894.

During April, 1896, work was again resumed, and a month was spent in unwatering the shaft and levels. The cross-cut west at the 900-ft. level was extended from the drive on what was considered the Guiding Star lode. In 1897 operations were resumed at the 800-ft. level, as well as in the west cross-cut and north drive in the 900-ft. level, and the north drive at the 1,000-ft. level. Large formations were met with at these levels during the succeeding years. Trial crushings at the Star of the East Company's battery during 1898 having proved that the stone was of payable quality, the company erected a 30-head battery, which was started in 1899. The crushings, however, did not come up to the former trials, and, although much prospecting at the 1,000-ft. and 900-ft. levels in large formations was carried out, it was not until the middle of 1901 that the battery was used to crush a small parcel of ore from the intermediate level between the 1,000-ft. and 900-ft. levels. Under 500 tons exhausted this formation, and work at the 1,000-ft. level, which had now reached over 1,400 feet north of the shaft, was stopped.

The western cross-cut at the 900-ft. level, which in July, 1898, had reached a total distance of 1,594 feet from the shaft, and which had been sealed by a dam, was re-opened in March, 1901, and drives were started on a formation at 1,400 feet west of the shaft. Work was carried on in the west cross-cut till November, 1901, when a total distance west of 1,900 feet was attained. This point being near the boundary, and payable stone having not been proved, all work at this level was stopped, and a start was then made to open out at 288 feet from the surface. By the end of 1902 a reef, which was subsequently found to be the Phœnix, was cut, and a rich shoot of gold was met with, which gave profitable results from this level and the levels above and below it, until the end of 1903. While these levels were on payable ore, a long drive north at the 645-ft. level was put in, and prospecting works were carried on till July, 1905, without meeting with any success. After the cessation of work at the 645-ft. level, a start was made to follow the shoot of gold below the 378-ft. level, as well as to prospect over the level in the north end. The winze workings, as well as the main drive, failed to give any prospects, and this led to their abandonment in February, 1906, when a start was made, after unwatering the shaft, to open out south on a lode showing in the 800-ft. cross-cut, as well as to stope in the north drive. A

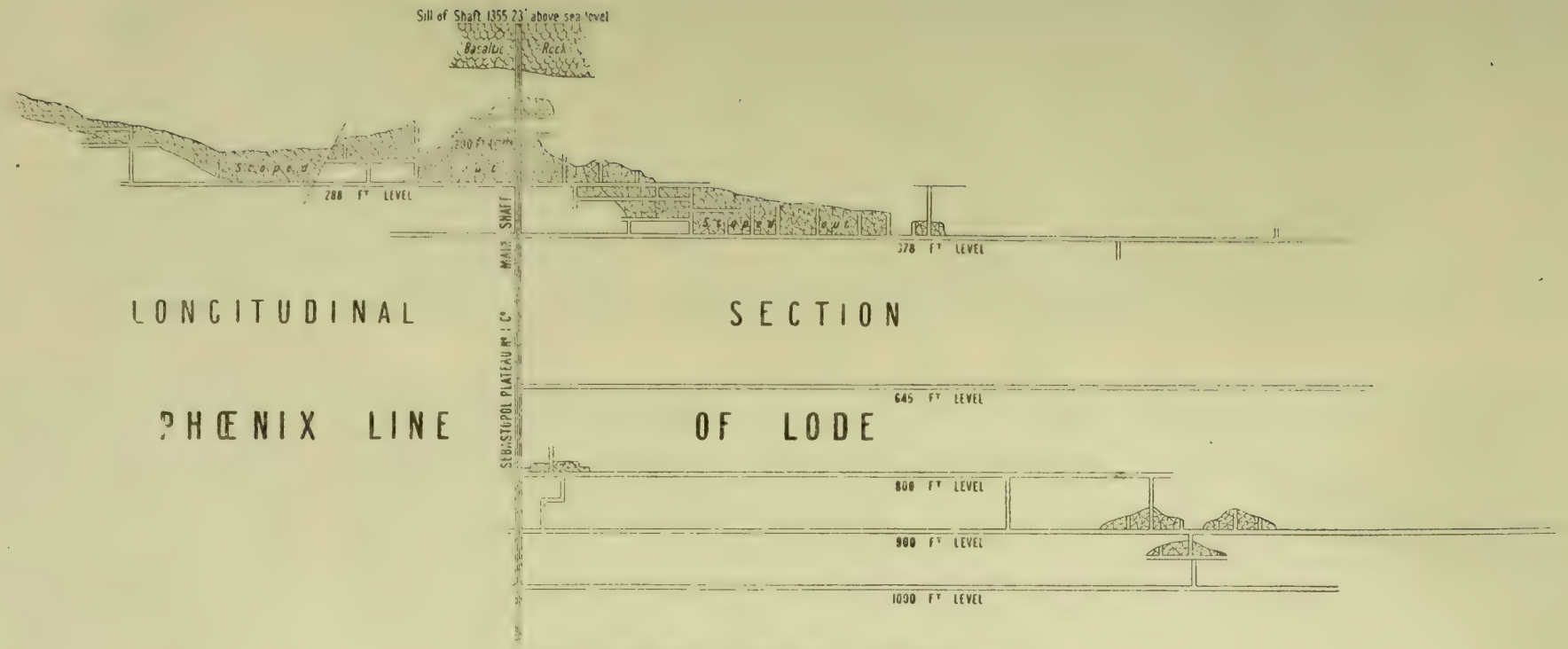



FIG. 32. Sebastopol Plateau No. 1 Mine. Scale :—300 ft. to 1 inch.

trial crushing proved the ore to be payable, but the quantity available was small, and the level was subsequently abandoned.

During 1907 operations were continued south at the 378-ft. level, besides prospecting for alluvial reef wash above the 200-ft. level. In 1909, after the mine had been closed down for over a year, operations were resumed by cross-cutting west at the 556-ft. level, and until the middle of 1912 prospecting in the shallow levels was continued with little success. In 1912, aided by Government assistance, the 900-ft. and 1,000-ft. levels were unwatered, and the lodes opened there were thoroughly sampled, but without encouraging results. On the Prince of Wales line of lode 1,900 feet west of the shaft driving north and south was commenced, but the lode track continued small. A rise over the 900-ft. level failed to locate the line of lode on the Guiding Star syncline at 1,120 feet west, and above the 1,000-ft. level a rise cut a lode in the anticline, well defined, but not payable. Early in 1914 all work at the mine ceased.

*Structure.*

The geological structure as revealed in this mine consists of a main anticline (the Albion) at 1,360 feet west of the shaft. West of this the strata dip regularly to the west, so far as proved by cross-cutting. Eastwards repeated folding is exposed towards a main syncline (the Consols), which occurs to the east of the shaft. A minor fold with a syncline at 1,120 feet, and an anticline at 1,150 feet west of the shaft is followed eastwards by strata having a general dip at a lower angle than usual to a syncline of considerable magnitude at 630 feet west of the shaft. The west-dipping strata east of the syncline are at a much higher angle, and would appear to indicate an eastward list to the synclinal axis. At the 900-ft. level about 350 feet west of the shaft an anticline is met with at the apex of which large makes of quartz occur, followed on the east by a syncline which exposes the same horizon at the 900-ft. level as the syncline to the west of the anticline at the 645-ft. level west of the shaft.

The syncline is located 70 feet west of the shaft at the 200-ft. level, and has an easterly list to about the 560-ft. level, and from there to the 900-ft. level the list is slightly to the west, the axis being 90 feet from the shaft at the 900-ft. level. On this syncline (the Phoenix) a payable auriferous inverted saddle reef, which pitched north, was worked above the 288-ft. level opposite the shaft. About 50 feet east of the shaft an anticline occurs, followed by 200 feet of east dipping strata.

The Black Slate (Indicator) or favourable horizon, is exposed in the 900-ft. level, on the west side of the Albion anticline at from 1,730 feet to 1,830 feet west of the shaft. This zone consists of, in ascending order:—Black and gray dolomitic slate with 8 in. of laminated quartz lode, slickensided in parts, and highly mineralized; 2 feet west a black slate of 3 in. in width, on which a slide has occurred, is followed by slate 10 feet wide, a grey and black slate occurring at 10 feet from the lode; 17 feet from the lode several black slates and mineral seams (pyritic) occur; 40 feet from the lode a black slate 4 in. wide occurs with crushed laminated quartz, and a highly graphitic polish. The uppermost black slate of this zone occurs 96 feet west of the lode. This zone of black slate appears to be identical with that exposed in the Central Plateau No. 2 shaft, and also in the Star of the East mine at 1,800 feet to 2,000 feet west of the No. 2 shaft, where the lode on the lower bed of the series is known as the Albion.

To the south of the Sebastopol Plateau No. 1 mine, the Prince of Wales and Bonshaw United companies worked a lode which was discovered in the earlier alluvial workings of the Prince of Wales Company's mine (see page 145). This lode is probably identical with that exposed in the 900-ft. level cross-cut.

East of the Albion anticline a series of west-dipping faults occurs, and a repetition of these also probably exists above the level. The effect of these faults is to carry the black slate zone apparently nearer to the centre of the fold on the eastern than on the western side. A minor fold occurs, and the zone is exposed east of this at between 850 feet and 960 feet from the shaft. At 960 feet a drive north has been put in on a well-defined wall dipping to the east, on which a little laminated quartz occurs, but the formation shows no sign of increasing in width. At 55 feet east of this a laminated track half-an-inch wide is exposed, and 60 feet further to the east there is a 2-in. laminated quartz track with black slate. The strata in this horizon, similarly to that on the west of the Albion anticline, is highly mineralized, scattered pyrites occurring throughout the slates and sandstones.

The next exposure of the black slate zone lies to the west of the anticline at 320 feet from the shaft. At 440 feet from the shaft a black slate with 2 in. of laminated quartz is exposed, and another black slate with 1 in. of laminated quartz shows on the west side, as well as on the east side of the anticline, about 10 feet distant. The main or lower bed of the series at this point, separated by a larger width of sandstone bars, is between the 900-ft. and 1,000-ft. levels, where it reaches the anticline, and on which an unpayable formation upwards of 5 ft. in width was proved by a rise.

*Reef Formations.*

The formations exposed in this mine may be classed as under:—(*a*) Bedded reefs; (*b*) fault reefs; (*c*) spurs.

*Class (a), Bedded Reefs.*—The Phœnix reef may be regarded as a true synclinal reef, the trough and west-dipping leg being highly auriferous at the 288-ft. level, and through to the alluvial. The fold pitched north, and in the trough the reef attained a width of 12 ft. to 14 ft., and a height of 10 feet to 14 feet, the west-dipping leg gradually tapering to a few inches before reaching the alluvial. In working this reef south of the shaft a cross-cut from the old Phœnix Company's alluvial shaft was discovered in which the reef had already been disclosed, and recorded in 1872. This fact led the present company to open out at a shallow level.

Throughout the description of this mine, the syncline with which the reef is associated will be referred to as the Phœnix syncline. The following formations occur in connexion therewith:—At the 378-ft. level a small synclinal reef was driven on a distance north of 400 feet, and south 200 feet, proving the reef for a width of 12 ft. with




Fig. 33. Synclinal Reef, Sebastopol Plateau No. 1 Mine, 378-ft. level, 262 feet south of cross-cut. Scale, 40-ft. to 1 inch.

a maximum thickness of 3 ft. at a point 100 feet south of the cross-cut, as shown in sections of the formation (Fig. 33). The fold pitched to the north at from 2 deg. to 8 deg., and carried galena, sphalerite, chalcopyrite, and pyrite, accompanied by small quantities of gold in the trough. The eastern leg of this synclinal reef was not prospected.

At the 556-ft. level, and at a point 55 feet west of the shaft, another small synclinal reef with stone about 9 in. wide in the trough was passed through in the cross-cut, and here a winze was sunk in the syncline, but no records of the results of this work were available. At the 900-ft. level, the legs of two small synclinal reefs are exposed at between 80 feet and 100 feet from the shaft. Both of these are small, and consist of tortuous laminated quartz veins up to 2 in. in the widest part; the trough of these formations will be found about 10 feet below the floor of the cross-cut.

The next syncline west of the Phœnix has been cut in the 900-ft. level only, and shows 625 feet west of the shaft. No legs are traceable at this depth. As the folding appears to be symmetrical, it is probable that a repetition of the Phœnix reef will be found at a shallower level in this syncline. The black slate zone in which the main Ballarat West lodes occur will be found on this syncline at from 1,400 feet to 1,800 feet in depth, but whether it will be auriferous or not is uncertain. Similar conditions exist above the 900-ft. level at 1,120 feet from the shaft, and the lowest of the black slate series will be probably met with above the level of the cross-cut. (A rise of over 100 feet failed to locate the black slate.)

Of the bedded reefs distant from the synclines those associated with the black slate zone may be referred to. These reefs, though small, are continuous, and usually increase in size, both in the proximity of the anticlines and synclines, though on their flanks shoots of payable width have been met with. The reef in the 1,000-ft. level is one of the legs of an anticlinal or saddle reef, from which no gold values were obtained. Above the 900-ft. level a minor black slate, with a small laminated quartz leg should reach its cap within 15 feet of the level, but the legs as exposed show no sign of increasing width, and the presence of a large fault with makes of quartz occurring above the level mask the saddle, if present. At the 1,000-ft. level, an east-dipping leg occurs with 12 in. of laminated quartz, and a west-dipping leg of 15 in. of laminated quartz on either side of the anticline. A rise which was put up on the east leg cut the cap, but nothing payable was met with. No driving was done on the formation.

On the Albion anticline the whole of the black slate series of saddles will have been denuded. To the east-dipping legs little reference need be made as they are mentioned above in connexion with the black slate beds, and have not been proved auriferous in any portion of the field. The west-dipping legs or lodes, although often unprofitable, have proved payable in part, and therefore are worthy of prospecting. The chief of these exposed in this mine occurs on the western flank of the Albion anticline at 1,730 feet from the shaft, where a highly mineralized lode 8 in. wide, associated with the black slates, and conforming to the bedding, was intersected in the cross-cut, and risen on for 80 feet. Driving north and south on this formation for a distance of over 400 feet failed to meet with any increase in the size of the lode, or to prove payable values. From its position, and seeing that the parallel black slates agree with those in the adjacent mines, this mine serves as the connecting link to correlate the Prince of Wales lode on the south with the Albion lode on the north, both being on the same horizon. A point of importance, however, lies in the fact that the Albion lode occurs to the west of the granitic dyke, while the Prince of Wales lode is east of that dyke. The strike of the dyke from the alluvial workings of the Prince of Wales to the most northerly recorded position in Sturt-street is N. 2° E., while the strike of the lode between the Prince of Wales and the Central Plateau mines is 6° W. This dyke shows in the 900-ft. cross-cut at 180 feet west of the most easterly black slate, or Prince of Wales lode.

On the anticline at 325 feet west from the shaft the black slates reach the cap between the 900-ft. and 1,000-ft. levels. The west-dipping limb has not been proved auriferous, and a rise above the cross-cut at 310 feet from the shaft reached the saddle 55 feet above the level. The saddle at this point was from 3 ft. to 4 ft. wide, and the eastern leg was the better developed, but carried no payable values.

The downward continuation of the west-dipping lode will reach the syncline about 600 feet below the 1,000-ft. level, and prospecting to this depth might be undertaken with a reasonable hope of success in so far as analogous favorable positions in the northern mines are concerned.

In the syncline at 1,120 feet west of the shaft a rise of 100 feet failed to locate the black slate in the roll, as a thickening of the beds had occurred. This syncline is identical with the one in which the Guiding Star lode occurred in the mines to the north. At this point the pitch was to the south, while in the Central Plateau the pitch was to the north, with the black slate zone 25 feet above the 860-ft. level cross-cut.

### *Details of Workings.*

*1,000-ft. Level.*—Work at this level commenced in July, 1896, when the cross-cut west was let on contract. At 52 feet, slate and sandstone bars with quartz leaders dipping east were recorded. At 305 feet west of the shaft a lode 3 ft. wide, consisting of black slate and quartz intermixed, carrying galena and sulphides, and underlying to the east, was met with, while 30 feet further to the west a track 6 ft. wide was cut, having a westerly underlay, and carrying nice laminated quartz 1 ft. wide on the footwall. The cross-cut reached a total distance to the west of 400 feet before driving was stopped in April, 1897.

*North Drive, 1,000-ft. level.*—This drive was opened out in April, 1899, on a nicely laminated lode from 12 in. to 15 in. wide, and showing a little gold. At 270 feet north of the cross-cut the formation was of a promising appearance, and covered the full width of the drive, 1 ft. of nicely laminated quartz on the hanging wall carrying gold in the solid. At 547 feet north of the main cross-cut an east cross-cut was put in 16 feet through a large formation carrying a little gold. At 575 feet north of the main cross-cut a cross-course striking north-east and hading to the south, was met with. At 648 feet north, the No. 2 east cross-cut was put in, passing through a bar of sandstone and some slate, with quartz leaders. At 700 feet north the lode still carried 1 ft. of laminated quartz on the hanging wall. This was saved for a trial crushing, but its value was not reported, as it was treated with stone from the level above. At 1,000 feet north, a small break threw the lode 8 feet to the east, the stone on the north side being 2½ ft. wide. At 1,150 feet north, a "horse" of mullock threw the lode to the west. At 1,090 feet north, the stone is 16 ft. wide, well

mineralized, carrying "galena, black-jack, and gold in the solid," and has a hanging wall underlying to the west. At 1,165 feet north, the No. 2 west cross-cut met a large body of stone accompanied by much water, which, when tapped, drained the 900-ft. level. North from the No. 2 west cross-cut for 200 feet only the track of the lode was followed. At about 1,250 feet north of the main cross-cut the No. 3 west cross-cut was put in for a distance of 82 feet, passing through well mineralized quartz 3 ft. wide, underlying to the west. At 1,430 feet the No. 4 cross-cut was driven 56 feet. The north drive stopped at 1,440 feet from the cross-cut.

At 1,200 feet north, a rise was put up, and connected with the No. 3 winze from the 900-ft. level. An intermediate level was opened out north and south at 50 feet in the rise. A drive was put in south 1,101 feet, and north 120 feet, at this level, on a big body of stone carrying gold on the footwall, and from which 480 tons were crushed for a total of 168 oz. 19 dwt. 18 gr. of gold, thereby exhausting the payable ore.

A little stoping was done above the main drive north of the rise, but the results do not appear to have been profitable, and, in 1901, work at this level ceased, and the workings were allowed to fill with water, in which state it remained until 1912. After unwatering the cross-cut, a rise was put up on the anticline at 310 feet west of the shaft, but, although the cap was reached, nothing of value was obtained, and the water was again allowed to rise.

*900-ft. Level, North Drive.*—A start was made in July, 1896, to drive north to the footwall of the lode at 280 feet west of the shaft. At 100 feet north, the lode was the full width of the drive, and in settled country. At 200 feet north from the cross-cut the drive was stopped, the face then showing quartz and slate, with a good deal of mineral and 6 in. of a "dig" on the footwall, which underlies to the west. At 320 feet west of the shaft a drive was opened north, on what was believed to be the hanging wall of the Guiding Star line of lode.

In October, 1897, the hanging wall drive was repaired, and driving to the north was resumed. At 260 feet from the main cross-cut, a cross-cut east proved the lode to be 22 ft. wide with 6 in. of laminated quartz on the footwall, from which nice colours of gold were obtained, and also seen in dish prospects. At 200 feet north of the main cross-cut a slide cut into the lode, and continued to 350 feet north. This slide dipped to the east. At 490 feet north of the cross-cut the lode in the face was very solid, carrying seams of black slate heavily charged with mineral. An easterly cross-cut at this point passed through solid lode, 25 ft. wide, of very promising appearance, carrying a good deal of mineral, including a little black-jack and galena. At 33 feet east a slide underlying to the west was met with. The main drive was extended in a large formation of promising appearance, carrying sulphides and, at times, a little gold. At 570 feet north a cross-course was met, which threw the lode 10 feet to the east.

The cross-cuts proved the lode to range from 18 ft. to 35 ft. in width between 500 feet and 750 feet north of the cross-cut. To 1,000 feet north the drive carried a full face of ore. At 900 feet north a slide was met with travelling parallel to the drive, dipping to the east, and pitching slightly to the south, so that it rose over the back of the level at 1,000 feet. The large formation continued, and although it was of promising appearance, it did not prove payable until at 1,100 feet north, where a slide, dipping west and pitching south, was met with, beyond which the quality of the stone improved. At 1,086 feet a cross-cut east was put in 28 feet to the footwall, which had an underlay to the west, and carried 6 in. of pug. At 8 feet from the hanging wall the cross-cut passed through laminated quartz 4 ft. wide, carrying fair gold, on which a rise (No. 4) was put up.

At 1,330 feet north of the cross-cut, a drive was put in east 50 feet across the lode, passing through a solid lode 14 ft. wide, well mineralized, and carrying a little gold, then 36 feet of slate, with quartz leaders carrying gold. The north drive was continued for a further distance in the large formation, but at about 1,500 feet north the lode became broken up, owing to a slide coming in. At 1,481 feet a cross-cut was put in east, passing through a slide dipping to the east at 33 feet, followed by clean country to the face at 85 feet. The lode in the main north drive continued broken, and at 1,680 feet north cross-cuts were started to the east and west; the east cross-cut passed through a lode formation, slate bars, and quartz leaders up to 62 feet; and the west cross-cut met a slide dipping to the east at 18 feet from the north drive. Work in the north drive was suspended for some months, but in May, 1900, it was again resumed, and 107 feet was added to the length, making a total of 1,796 feet, the latter portion being on a track of lode which underlies east. At 1,756 feet a cross-course was met with travelling north-east and south-west, which threw the country a few feet to the east, and at 1,790 feet another cross-course travelling north-west and south-east was struck. On the latter cross-course a drive was put in westerly, and at 18 feet from the north drive, slates, sandstones, and quartz leaders, dipping west, were cut. At 200 feet along this drive a big slide, dipping east, was met, and in November, 1900, work was suspended at 233 feet.

*Rises and Winzes, 900-ft. Level.*—The No. 1 rise, 25 feet north of the main cross-cut, was put up 55 feet on a large formation carrying galena and black-jack, and connected by driving north 40 feet and 22 feet east across a strong formation to the winze sunk on the slide below the 800-ft. level. The No. 2 rise, 350 feet north of the cross-cut, was put up 35 feet on a large body of well-mineralized stone. The No. 3 rise, at 900 feet north of the cross-cut, was put up 80 feet on the lode, until a slide was met, which threw the lode 14 feet to the east, as proved by a cross-cut at 95 feet high in the rise, the lode here being 12 ft. wide. About 70 feet up in the rise a level was opened out and driven east across the lode for a distance of 29 feet, through a strong formation, into the footwall. At 1,086 feet north of the main cross-cut, in a cross-cut 8 feet east of the hanging wall, the No. 4 rise was put up 55 feet, with a full face of laminated quartz carrying good gold. Work was suspended here during the erection of the battery, and was resumed in October, 1899, when the rise was put up high enough to connect with the 800-ft. level. At the same time drives north and south were started from the top of No. 3 rise on a large formation, with galena, black-jack, and occasionally some fine gold. The No. 5 rise, 1,216 feet north of the cross-cut, carried for 26 feet up a full face of laminated stone with good gold. No

sign of the footwall being met with at 20 feet up in the rise, a drive was opened out east, passing through a lode 10 ft. wide, carrying good gold, but with still no sign of the footwall. At a height of 60 ft. in No. 5 rise, a drive eastwards cut the footwall at 44 ft. and drives were put in north 25ft. on the footwall, the face carrying 2½ ft. of quartz, with a little mineral; and north 25 feet on the hanging wall on a body of stone 12 ft. wide, well mineralized but not payable, owing, it was thought, to a slide, which was passed through 40 feet up the rise, and which displaced the lode 18 feet to the east. Stoping was carried out from the south side of the No. 4 rise to north of the No. 5 rise, on a body of stone from 4 ft. to 20 ft. wide, with varying results (see list of crushings below). A rise was put up on the footwall 160 feet north of the main cross-cut. This was carried up 55 feet, passing through slate with quartz leaders dipping very flat to the west.

At 920 feet north of the main cross-cut a winze was sunk. For 16 feet a large body of stone, mineralized and yielding gold in dish prospects, was sunk on. At 30 feet sinking was suspended owing to water trouble, the stone in the foot of the winze showing a little gold. The No. 2 winze was sunk south of the No. 4 rise, but only reached a depth of 5 feet in a full face of nicely laminated quartz carrying good gold. At 1,144 feet north of the cross-cut the No. 3 winze was started, where good gold was cut in the main drive. For 33 feet a big formation, carrying galena, black-jack, and free gold, was sunk on. At 68 feet a connexion was made to the intermediate above the 1,000-ft. level, after which very little appears to have been done below the 900-ft. level.

*900-ft. Level South.*—During 1898 a drive was put in south a distance of 200 feet in a full face of ore, which yielded a little gold in dish prospects.

*800-ft. Level.*—The cross-cut west from the main shaft was extended from 150 feet to 323 feet early in 1897. At 295 feet west of the shaft a body of stone 8 ft. wide, with an eastern underlay, well mineralized, and carrying some galena and black-jack, was met with. After passing this big stone, leaders, carrying fine gold, were met. In March, 1897, the cross-cut was stopped at 357 feet from the shaft. A north drive was opened out at 320 feet west of the shaft, and a big body of stone was followed. At 200 feet north of the cross-cut, the lode proved to be 12 ft. wide, and carried mineral, including some black-jack and galena. At 30 feet north of the main cross-cut some good values were found, and a rise was put up at this point for 36 feet on a lode 3 ft. wide, which carried a little gold. At 36 feet up in the rise the lode became broken. At 50 feet north of the cross-cut, the No. 2 rise was put up 30 feet in ore carrying gold. At the top of this No. 2 rise a cross-cut was driven 36 feet east into the footwall, passing through a lode formation 10 ft. wide. At 70 feet north of the cross-cut a winze, which connected with the intermediate level above the 900-ft. level, was sunk on a large highly mineralized formation underlying flat to the west.

Towards the end of 1898 work was resumed in the north drive, which was extended on the footwall of the lode to 636 feet north, where the lode, 14 ft. wide, solid and mineralized, was crossed, and the hanging wall followed. At this point the north drive connected with the south drive from the top of the No. 3 rise above the 900-ft. level. Meanwhile a drive north was put in from the No. 3 rise for a total length of 212 feet, leaving on the eastern side of the drive quartz which carried galena, black-jack, and gold. Stoping below this point was commenced in February, 1899. At 1,123 feet north of the cross-cut the north drive connected with the No. 4 rise, thus securing good ventilation for both the 900-ft. and 800-ft. levels and their stopes. Nothing further was done in this level until 1906, when a small crushing was taken from near the main cross-cut, and several cross-cuts put in across the lode at 100 feet intervals. A south drive was also put in 87 feet, and a rise put up for 19 feet, without meeting sufficient encouragement to continue, so the level was abandoned.

*645-ft. Level.*—The north main drive was opened out in February, 1903, while good stone was being worked about the 288-ft. level. Although upwards from the 288-ft. level the reef had an underlay to the west, the impression obtained by driving north on an east-dipping reef at the 378-ft. level was that the lode would be found at each level nearly vertically below the level above. In consequence of this impression the north drive at the 645-ft. level was started at 67 feet west from the shaft, on a west-dipping fault in the centre of a sharp synclinal fold. The north drive to 427 feet carried a good footwall, with vertical "makes" of quartz, occasionally showing minerals. For the next 400 feet the footwall stone was regular, the hanging wall stone showing minerals. To 1,389 feet from the cross-cut a footwall was driven on, which carried veins showing sulphides and a little gold. At 1,100 feet from the main cross-cut, another cross-cut was put out west for 28 feet, the manager reporting—"For about 12 feet the country was full of flat and vertical veins, all of which carried a little gold. The syncline occurs at 22 feet in this cross-cut."

The north drive was extended to a total distance of 1,500 feet, the hanging wall side of the drive carrying quartz veins which were prospected without success. At a point 1,465 feet north of the cross-cut a rise was put up for 100 feet, passing through a slide underlying west at 70 feet, on which a drive 18 feet in length was put in. At 100 feet in the rise a cross-cut was driven west for 130 feet, and at 38 feet west of the main rise a second rise was put up for 100 feet, making a total of 200 feet above the 645-ft. level. Cross-cuts were opened out from the top of the rise at the 453-ft. level. The east cross-cut reached 176 feet, passing through several flat and vertical quartz veins, some of which carried a little gold, and the west cross-cut was extended to 46 feet, carrying irregular bunches of quartz and a little water.

The cross-cut east at the top of the main rise 100 feet up was extended 45 feet through a large formation which carried black-jack, galena, and a little gold, and was accompanied by a good flow of water. Here a drive was put in south 20 feet, from the face of which a rise of 32 feet passed into clean country. No further work was done at this level since the date of the cessation of operations in May, 1905.

*378-ft. Level.*—Work at this level commenced early in 1902, and the cross-cut west was put in 148 feet by August of that year. At 74 feet from the shaft a drive was put in north on what was then considered to be the lode coming down from the level above. As a matter of fact, however, the nature of the formation not being recognised,

the upper level was on the west dipping leg of a synclinal reef, while that opened out on was the east dipping limb of a distinct reef, though occurring in the same syncline. The formation consisted of mineralized ore, about 3-ft. wide, underlaying east and pitching to the north. At 300 feet north a rise was put up and connected to the 288-ft. level; an intermediate level was put in 45 feet above the 378-ft. level and driven north for 100 feet on a large body of payable ore.

anything payable, and suspended to resume operations in the lower levels, early in 1906.

In November, 1902, work at the lower levels (900-ft. level and upwards) was suspended and a cross-cut west started at 288 feet from the surface. At 75 feet west of the shaft a lode (the Phœnix) 6 ft. wide carrying a good footwall underlying west was met with. The lode was well mineralized, contained black-jack, and yielded gold from the intermixed slates and on roasting of the mineral

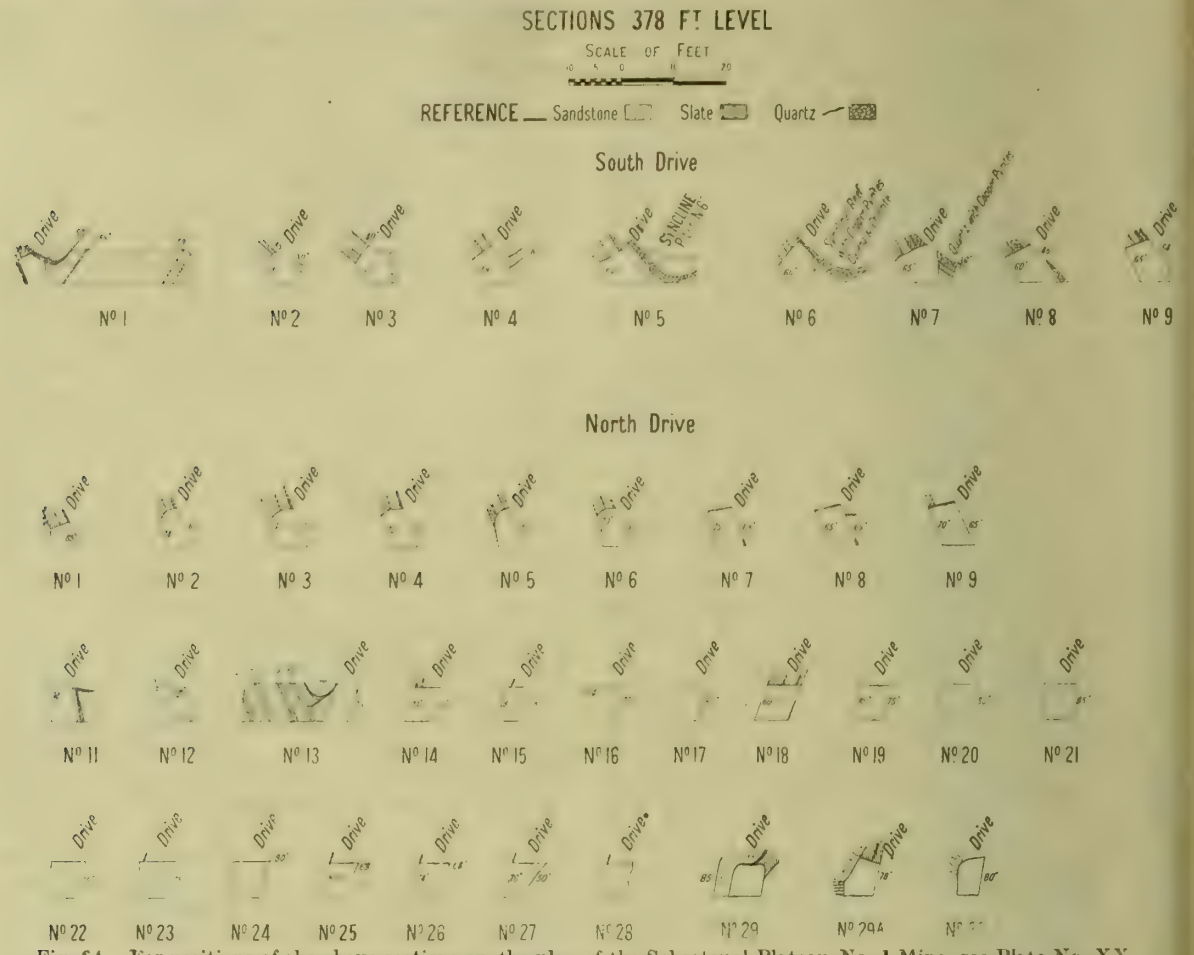



Fig. 54. For positions of the above sections on the plan of the Sebastopol Plateau No. 1 Mine, see Plate No. XX.

Another intermediate level was opened out to the south at 65 feet above the 378-ft. level, and this was driven south for 200 feet, connecting with a winze which was sunk below the 288-ft. level. This winze had passed into clean country at 37 feet below the main level, as proved by the cross-cuts from it 10 feet west and 12 feet east. Stoping to the 288-ft. level was carried out above the south intermediate level and north for about 120 feet, where the stone pitched underfoot and was stoped up from the 378-ft. level to the north intermediate level.

In the main level at 550 feet north from the cross-cut the face consisted mainly of quartz showing plenty of mineral and much gold. At 814 feet north the stone still showed gold. Work in this drive was suspended for two years as the stopes became worked out, but in 1905 the north drive was further extended, and at 1,067 feet a well-defined lode was showing on the footwall, carrying nice mineral and some gold with a few quartz veins on the hanging wall side. At 1,060 feet north of the cross-cut a winze was sunk to 54 feet carrying a well-defined footwall, the manager reporting, "Stone, bearing mineral and gold, with black slates coming in on the hanging wall side." Later, however, this winze was cleaned out and found to have bottomed in the syncline with no stone on the fold. The north drive was extended to 1,528 feet without meeting in the quartz. A drive north proved the lode of good quality to 260 feet, where the stone pitched underfoot; north of this point a "track," carrying gold by dish prospects from rubble, was followed for about 70 feet.

The south drive at the 288-ft. level carried a full face on the lode for some distance, but, owing to the nature of the formation, which pitched north at 160 feet south of the cross-cut, the golden shoot was 30 feet above the level. On this account an intermediate level was put in at 40 feet above the south drive, starting from the rise at 180 feet south of the cross-cut. The main south drive was stopped at 273 feet south. In the intermediate level at 340 feet south of the main cross-cut, a cross-course was met with which threw the lode 12 feet west and 50 feet down. This brought the golden stone to the level of the main drive, and, consequently, work was resumed in the south face. At 363 feet south of the cross-cut, the cross-course was struck, and beyond it a large formation showing gold. A leading stope over the drive south of this took in a formation 24 ft. wide. At 697 feet south a rise was put up 60 feet, and an intermediate level was opened out south on a large formation showing gold and still pitching to the north. This intermediate level and stopes were continued to the southern boundary (about 900 feet from the shaft) on payable ore. The stopes nearer to the shaft were

connected to the 200-ft. level. The stopes above the 378-ft. level produced profitable stone until the end of the year 1903. For records of yields see below :—

*Quantity of Stone Crushed, &c.*

| Half-Year ending— | Quartz Crushed. | Gold Obtained. | Where Obtained. | Remarks. |
|---|---|---|---|---|
| | tons. | oz. dwt. gr. | | |
| August, 1898 | 712 | 272 1 23 | 900-ft. level north | Crushed at Star of the East |
| February, 1899 | 1,543 | 562 14 6 | 900-ft. level north | Crushed at Star of the East |
| August, 1899 | 995 | 156 12 0 | 900-ft. level north | Crushed at own battery |
| February, 1901 | 400 | 56 10 0 | 1,000-ft. level north and intermediate | Crushed at own battery |
| August, 1901 | 480 | 168 19 18 | Intermediate above 1,000-ft. level | |
| August, 1902 | 2,175 | 3,010 3 12 | 288-ft. level | Phœnix line of reef |
| February, 1903 | 3,170 | 1,776 5 0 | 288-ft. level and stopes | |
| August, 1903 | 7,775 | 3,880 14 0 | 378-ft, 268-ft. levels and stopes | |
| February, 1904 | 1,063 | 638 1 6 | 378-ft., 288-ft. levels and stopes | |
| August, 1906 | 275 | 77 5 0 | 800-ft. level | |
| | 156 | 28 18 6 | 378-ft. level and above | |

A few small crushings were put through at irregular intervals during the succeeding years till December, 1911, the total value of the gold obtained to that date being £45,964 11s.

## BALLARAT EAST MINES.

### THE VICTORIA UNITED COMPANY.

### (Pl. XVII.)

The Victoria United Company was formed in 1894. The lease included the areas formerly occupied by the New Victoria Company, which succeeded the Victoria (1890 to 1894), the Duchess, the Parade, the Queen's Jubilee, the United Black Hill, Spanhake's and the Wellingtonia Gigantea companies.

The mine, which is the most northerly of the group surveyed, occupies a position on the southern side of the Black Hill Flat, and embraces an area of 50 acres held under lease and miners' right claims.

The mine affords a section which illustrates how certain of the slates disappear at a depth owing to the folding of the beds. This structure was not recognized, and certain beds were supposed to occur always at the same distance east or west of other beds, and much confusion resulted from this theory. For example, at the 572-ft. level, the Indicator lies 15 feet west of the shaft, and the 4-ft. Slate 135 feet further west. At the 640-ft. level a leather jacket fault cuts across the Indicator near a syncline. Below the 726-ft. level the leather jacket faults the 4-ft. Slate, which, however, was recognised below the fault, and traced to the lowest level. The diagram (Fig. 35) clearly shows that a drive of 135 feet east of the 4-ft. Slate anywhere below the 726-ft. level passed through a synclinal fold instead of through parallel beds.

At the 1,305-ft. level a payable formation was found 150 feet east of the 4-ft. Slate. It occupied about the same position relative to the slate as the Indicator did in the upper levels, and was therefore considered to be a formation on the Indicator, whereas it occurred on a repetition of the 4-ft. Slate itself.

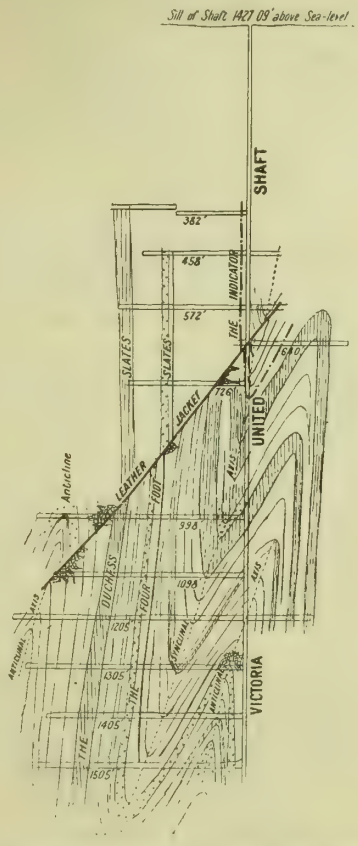



Fig. 35.—Transverse Section of the Victoria United Mine (looking north). Scale, 400 feet to 1 inch.

### *Structure.*

The western workings are in the eastern limb of an anticline. To the east of this is a syncline followed by a minor anticline. The axes of the folds have a decided westerly list, averaging 1 in 3, which causes the beds to dip in the direction shown in the diagram. Until the true structure was worked out, the low western dip of the beds on the western limit of the anticline was ascribed to faulting.

At the 998-ft. level the main anticline (First Chance axial line) is well shown in the cross-cut at 370 feet west of the shaft (Fig. 36), and also

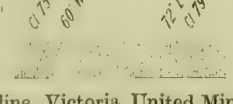



Fig. 36.—Anticline, Victoria United Mine, 998-ft. level, 370 feet west of shaft. Scale, 40 ft. to 1 in.

at the 1,205-ft. level at 430 feet west of the shaft. At the 1,305-ft. level the same fold is exposed in a west cross-cut 127 feet north of the main cross-

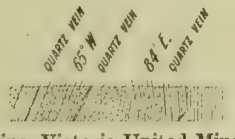



Fig. 37.—Anticline, Victoria United Mine. 80 feet west of drive, 127 feet north of main cross-cut, 1,305-ft. level. Scale, 40 ft. to 1 in.

cut and at 450 feet west of the shaft. At this point the fold shows a marked overthrust (Fig. 37).

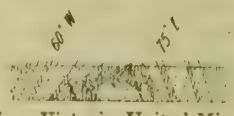


Fig 38.—Anticline, Victoria United Mine, 1405-ft. level, 60 feet west of shaft Scale, 40 ft. to 1 in.

The syncline east of the Indicator is 30 feet east of the shaft at the 572-ft. level, in the plat at the 640-ft. level, and 40 feet west of the shaft at the 998-ft. level. From this point it can be

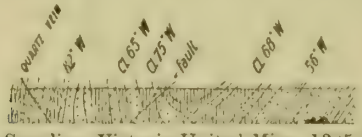


Fig. 39.—Syncline, Victoria United Mine, 1305 ft. level, 140 feet west of shaft. Scale, 40 ft. to 1 in.

easily located at each level down to the 1,505-ft. level, where it is 197 feet west of the shaft. At the 1,605-ft. level, the syncline occurs in a wide bed of slate, between 225 feet and 275 feet west of the shaft. The minor anticline east of the syncline first shows in the plat at the 1,205-ft. level. At the 1,305-ft. level a large quartz formation occurs on the fold at 40 feet west of the shaft. At the 1,505-ft. level the centre of the fold lies 75-ft. west of the shaft, and at the 1,605-ft. level 105 feet to the west.

Overfolding occurs more especially in the deeper levels. In the upper levels the beds constituting the eastern limb of the main fold are almost vertical, but below the 998-ft. level most of these beds dip between 60° west and vertical. The eastern dip is noticeable only in the proximity of the syncline, and is rarely as low as 75° east. On the western limb the dip ranges from 75° to 55°, averaging about 60°.

As mentioned above, the Indicator was traced to its intersection with the leather jacket below the 640-ft. level. In the upper workings where the strata were vertical, the Indicator was cut in the various cross-cuts at 10 feet to 15 feet west of the shaft. In the 640-ft. level at 52 feet east of the shaft and beyond the syncline, there is a mineral seam similar in appearance to the Indicator and occupying the same relative position on the western dip. At the 726-ft level the Indicator country, under the leather jacket, is 18 feet west of the shaft, and dips 70° east. It should fold over the syncline, which is only 20 feet to the east, at a depth of under 850 feet from the surface. At 15 feet or 20 feet west of the Indicator there is a big slate which occupies the same relative position along the whole of the line as far as the North Woah Hawp mine.

The 4-ft. Slate, or Victoria line, which is recognisable throughout the mine, is a slate with numerous well-marked cleavage lines, and occasionally one or more seams of pyrites. It is situated on the eastern side of a coarse sandstone 10 feet wide. This slate is exposed at all the levels below 458 feet deep, and is remarkable for its consistent width, seldom varying more than a few inches except near the syncline at the 1,505-ft. level, where it is nearly 30 feet wide, and within 12 feet of the syncline. At the 1,605-ft. level a wide bed of slate occurs in the syncline at 250 feet west of the shaft, and this bed, after allowing for faulting, appears to be the 4-ft. Slate on the fold. At the 1,505-ft. level the bed is repeated on the east side of the syncline at 150 feet to 180 feet west of the shaft. It also occurs on the eastern limb of the syncline at the 1,405-ft. level at 90 feet west of the shaft, where it is still in contact with the same coarse sandstone. At the 1,305-ft. level the 4-ft. Slate is on the anticline at 50 feet west of the shaft, and associated with a large payable quartz formation. The extension of the 4-ft. Slate on the eastern limb of this anticline can be seen at 2 feet 6 inches west of the shaft at the 1,505-ft. level.

The wide belt of slate forming the western limit of the auriferous belt of country is known as the Duchess Slates. The name has been misapplied to the slate cut in the lowest level of the Duchess shaft, for this slate is apparently on the anticline, and at 80 feet to 110 feet west of the 4-ft. Slate. The so-called Duchess Slates at the lower levels contain the various piths (*see below*), and at the 998-ft. to 1,405-ft. levels they lie at 90 feet to 120 feet west of the 4-ft. Slate.

Three basic dykes occur in that portion of the mine north of the main cross-cuts. In the upper levels they are decomposed to a clay, and are known as clay banks. At lower levels they are solid when first met with in the drives, but they rapidly break up on exposure to the air. The most southerly dyke forms along a cross-course, which displaces the strata 20 feet, but the other two merely break through the strata and quartz lodes without causing any apparent horizontal or vertical displacement except a lateral displacement of the width of the dyke.

Three types of faults are shown in this mine:—(1) Slides, "piths," "pugs," &c; (2) leather jackets; and (3) cross-courses. The piths or pugs form along the bedding planes on the eastern limb of the anticline, and in all observed cases they conform to the bedding planes, but do not appear to be continuous from level to level, in some places being 3 feet or 4 feet apart, and in others 8 feet to 10 feet. The amount of vertical displacement on these piths is usually small. The piths are well shown at the 998-ft. level, between 218 feet and 254 feet west of the shaft; also at the 1,205-ft. level at 220 feet, 237 feet, and 262 feet west of the shaft. The piths are of importance in the working of the intersecting quartz spurs, firstly since they afford one wall or "let-go" for rising or driving on, and secondly because the small amount of displacement along their course breaks the quartz veins, and appears to have a direct effect on the gold contents, which is invariably higher along the pith itself than elsewhere. That the piths are later than the final stage of gold-deposition is also apparent, since films of gold are common along the striated quartz faces, and instances are recorded of what appear to be small nuggets cut across by the piths. In some cases the evidence that the two portions of such lumps could be matched, although several inches apart when found, has been regarded as conclusive. No such evidence was available during the survey.

The main fault or leather jacket in this mine also traverses the Last Chance and Britannia mines to the south. In the latter mines a decomposed dyke ("the pug") occurs along the fault,

but no dyke is associated with it in the Victoria United mine. The fault strikes N. 40° E., and is traceable from the shaft at the 640-ft. level to 390 feet west of the shaft at the 1,098-ft. level. Below this level it intersects the anticline, and dies out on the west-dipping beds.

The amount of displacement along the leather jacket is 30 feet to 40 feet opposite the shaft. Another leather jacket shows on the 4-ft. Slate at the 1,205-ft. level, and lies 375 feet west of the shaft at the 1,305-ft. level. On the anticline at 50 feet west of the shaft at the 1,305-ft. level there is a strong leather jacket, which is in the syncline at 170 feet west of the shaft at the 1,405-ft. level, and also exposed in the 1,505-ft. level at 300 feet west of the shaft. Quartz veins occur associated with the fault at this point, where the displacement on the fault is about 25 feet. Numerous minor faults parallel to the main leather jacket show in the 1,505-ft. level, but they are apparently of little importance.

At the 1,605-ft. level a well-defined leather jacket fault was passed through at 295 feet west of the shaft. This appeared to be the continuation of a small fault exposed at 210 feet west of the shaft at the 1,505-ft. level.

Small cross-courses show at 340 feet north of the main cross-cut at the 1,305-ft. level, where a basaltic dyke fills the fault. The displacement here is about 20 feet horizontal and 10 feet vertical.

Four types of quartz deposits occur in this mine:—(*a*) those on the leather jacket; (*b*) spurs; (*c*) anticlinal or saddle formations; and (*d*) verticals and bedded veins.

The principal formation, the Britannia lode, was on the leather jacket. The quartz ranged from a few inches to 50 ft. or 60 ft. wide, and veins extended above and below the reef for upwards of 100 ft. in width. This reef was worked from south of the shaft at the 728-ft. level to 1,400 feet north at the 1,405-ft. level.

The quartz spurs, especially above the 572-ft. level were rich, and along the Indicator belt numerous specimens were obtained (see records of the Parade, Black Hill, and other companies at shallow levels). On the 4-ft. Slate at the 998-ft. and the 1,098-ft. levels, rich spurs were worked, and it is noticeable that the rich gold ceased where the overthrust of the eastern limb occurred, although the spurs became plentiful. The distribution of gold on the leather jacket formation is similarly influenced by the dip of the strata and the gold stops on the anticline. Owing to the divergence in strike northwards between the axial line and the leather jacket, a greater distance must be driven at each level to reach the favourable country.

At the 1,305-ft. level at from 30 feet to 60 feet from the shaft an anticlinal formation was worked during the period from 1909 to 1911. It consisted of a large body of payable quartz in the fractured 4-ft. Slate. Below this level on the western dip the quartz was poor. Above the level very little prospecting was carried on.

The vertical or bedded quartz veins are of little importance. Veins of this type occur at the 1,205-ft. level on the north side of the shaft. They are usually laminated, and consist largely of quartz, albite, and dolomite, often carrying sulphides and much chlorite, but they are never auriferous.

Seams and patches of pyrites are common apart from the Indicator of the upper levels; such seams occur at the 1,098-ft. level at 105 feet west of the shaft in a slate bed, which is upwards of 20-ft. wide with only a few minor ribs of sandstone. In the 1,205-ft. level at 30 feet west of the shaft, a west dipping mineral seam one-eighth of an inch wide shows above a small fault which has displaced the seam 4 feet.

Three other mineral seams were noticed. One occurs at 52 feet from the east face of a cross-cut off the north drive, 248 feet north of the main 1,305-ft. level cross-cut; another along a bedding plane dipping 65° west at the 1,305-ft. level, at 102 feet from the shaft; and the third in a bed of slate at the 1,405-ft. level, at 221 feet from the shaft.

Dolomite, both as crystals and in the massive form, is common as veins, either alone or intermixed with quartz. The colour varies from white to pink. Dolomite associated with the lodes usually occurs along the margins of spurs, but occasionally reddish patches are found in the quartz at some distance from the walls. Good specimens of the pink dolomite were obtainable in the cross-cut 248 feet north of the main cross-cut at the 1,305-ft. level, in workings along a fault at 60 feet west of the north drive. The dolomite was largely confined to a bed of slate, but to the westward a white dolomite vein occurs, forming the base of a quartz spur and containing dodecahedral crystals of pyrites. At the 1,205-ft. level pink dolomite shows in the 4-ft. Slate.

*Details of Workings.*

After pumping out the water, the Victoria United Company began shaft-sinking in 1895, from 740 feet, the depth reached by the Victoria Company in 1894. Between 830 feet and 900 feet, a few highly mineralized veins carrying a little gold were found and proved by trial crushings to contain 2 dwt. to 3 dwt. of gold per ton. A depth of 900 feet was attained prior to March, 1896. After putting through a number of trial lots of stone, most of which proved valueless, the battery began to crush payable stone in June, 1895. The company's supply was augmented by several tribute parties, who located makes of quartz in the upper levels before the end of that year. To meet the expenses of shaft-sinking and the installation of pumps, a number of reserve shares were sold, and fourteen calls of 3d. each were made prior to the end of April, 1897. The crushings during 1896 were small, but the average yield was over 6 dwt. of gold per ton. Towards the end of 1897, the tonnage crushed fell away still further, but the average yield rose to over 11 dwt. to the ton. The installation of rock-drilling machinery increased the expenditure, and two calls of 2d. and four of 3d. each were made for the half-year ending October, 1897. In 1898 further calls were necessary, but towards the end of the year the discovery of large bodies of good stone enabled the company to declare dividends as well as to purchase the Black Hill Company's battery.

In 1899 development work was kept well in advance of stoping. The yield from large tonnages was over 10 dwt. to the ton for the half-year ending April, 1899, and 8½ dwt. for the

succeeding half-year. Early in 1900 new boilers and a compound engine with a condenser were added to the battery. The yield showed a slight falling off in the grade of the stone crushed, but occasional dividends were paid during the year. In 1901 the average yield per ton fell below 6 dwt., and only one dividend of 6d. per share was paid. In 1902 the tonnage was increased, but the gold yield was smaller; the development work was kept well ahead, and one dividend of 6d. per share was paid. In 1903 two dividends were declared; the average yield was now a little over 5 dwt. to the ton. Early in 1904 a slight improvement in the average yield made a large increase in the profits, and for the half-year ending April two dividends of 6d. per share were paid, and these were followed by two more during the next half year.

In 1905 the yield improved and the tonnage increased. Three dividends of 6d. per share were paid for the half-year ending April, and two for the half-year ending October, while £1,500 was expended on machinery, a new winding engine being added. The new engine proved to be economical as regards fuel consumption, and this, together with a slightly improved average yield, was responsible for a number of dividends in 1906 and the two following years. In 1907 a plant was erected, and the deepening of the Queen's Jubilee shaft was begun. The chief advantage to be gained by utilizing this shaft was a saving on the cartage of quartz and the disposal of mullock, which had to be carted away from the old shaft of the Victoria Company. The Queen's Jubilee shaft was cut down to a depth of 316 feet before the project was abandoned in 1908. For the half-year ending April, 1908, 15,192 tons yielded 5,204 ozs. of gold, an average of nearly 7 dwt. to the ton.

In 1909 the discovery of a new formation near the shaft at the 1,305-ft. level assisted the company very considerably; several dividends were paid, and much developmental work was undertaken. In 1910, dividends ceased; costs increased with depth; developmental work failed to locate payable stone in the levels opened. Prospecting at a depth was now necessary, and funds were conserved for shaft-sinking. The sinking of the shaft from the 1,405-ft. to the 1,505-ft. level was completed in June, 1911, the total depth, including the well, being 1,533 feet.

Yields from the 1,505-ft. level did not prove as good as was expected after a couple of hundred feet of driving. Work ceased in 1913, and the level was left until 1914, when auriferous ore was located within 10 feet of the abandoned face; and this supplied crushing material, but the yields were barely payable. The extensive stopes in the northern end of the mine at the 1,205-ft and 1305-ft. levels proved irregular in value, and were abandoned early in 1914, but after a trial by tribute parties they were re-opened, and payable crushings were obtained.

Early in 1915 the shaft was sunk to 1,618 feet from the surface, and a cross-cut was opened west at the 1,605-ft. level. This cross-cut was continued to 332 feet, passing through several gold bearing quartz veins, which were tested, but proved unprofitable. At the end of 1915, the mine was closed down and the machinery moved.

Details of the various workings are given below, the particulars being obtained from the manager's reports and surveys of the accessible workings.

*572-ft. Level.*—During 1896 the country north of the main shaft was drained and made available for working. A drive was put in north on the Indicator, and four tribute parties worked payable stone within 300 feet of the cross-cut. The main cross-cut was driven west to prove the western country. The north drive was extended to 520 feet, and connected with the drive put in by the Black Hill United Company; the old drive had been abandoned through want of appliances to cope with the water, and it was, therefore, necessary to drain a large area of old ground after the connexion had been made. In the Black Hill United claim a cross-cut east was put in 240 feet for the quartz which had been left there, and two rises were put up to meet these bodies, which, however, proved to be poor. During 1897 the tributers obtained fair results above this level.

*726-ft. Level.*—In 1895 the west cross-cut was driven 196 feet, and in 1903 a drive was begun at 240 feet west of the shaft. In 1905 this drive was extended to 486 feet, and at this point a rise was put up 31 feet, and an intermediate level was opened south to a payable formation which had been worked by the Britannia Company to its boundary 30 feet south. Profitable results were obtained from this portion of the mine during 1905.

*894-ft. Level.*—The cross-cut west, commenced in 1896, intersected a number of gold-bearing quartz veins. At 80 feet from the shaft a formation 6 ft. wide yielded 10 dwt. of gold to the ton, but in the drives put in north and south the value fell to 5 dwt. to the ton. In the south drive at 96 feet the quartz pitched underfoot and averaged over 16 dwt. to the ton. At 240 feet from the shaft were the Duchess Slates, which carried a vein 1 ft. wide, showing coarse gold. Several flat makes dipping north and east were cut between 270 feet and 370 feet from the shaft. At 250 feet from the shaft a drive on the Britannia line was put in south for 525 feet to the boundary. At 356 feet south, cross-cuts were driven east 57 feet and west 58 feet; in the former a flat make of payable quartz was found at 42 feet, on which drives were put in north and south.

In 1897 a number of crushings from the veins 1-ft. to 3-ft. wide at 120 feet from the shaft gave variable results. A rise was put upon these quartz veins.

Driving and stoping were carried on till 1900, mostly on quartz veins 6 in. to 1 ft. 6 in. wide.

In 1904 work was resumed at this level from a rise 220 feet south of the cross-cut at 163 feet west of the shaft. At 42 feet above the level a make of quartz 12 ft. wide yielded 45 oz. 6 dwt. of gold from a trial crushing of 138 tons. Tributers were successful during 1905, but early in 1906 the ore was exhausted.

*998-ft. Level.*—Cross-cutting at the 998-ft. level began in 1897, the bulk of the work being done by rock drills, at a cost of £1 1s. 10d. per foot. At 166 feet west of the shaft there was a quartz vein 1 ft. 6 in. wide showing coarse gold. Belts of gold-bearing country were found, between 235 feet and 320 feet, and a drive was put in south along the most westerly one at 320 feet on payable quartz, with rich veins still further to the west; the main body was low grade stone over

35 ft. wide. During 1898 the drive was continued to the boundary and stoping began. Rises above this level disclosed several flat auriferous veins, some of which proved on stoping to be of good quality. Stoping on these veins was continued with success until the end of 1900.

No. 1 north drive was opened at 170 feet west of the shaft along a large body of auriferous quartz. A crosscourse at 280 feet north of the cross-cut disturbed the country, and to the north of this a prospecting drive was extended westward on quartz veins from 10 in. to 2 ft. wide, which were well mineralized overhead and underfoot. A body of quartz was stoped to a height of 18 feet for 280 feet north of the crosscourse; it was 20 ft. wide, and extended above the top of the stope. The stope over the cross-cut was worked 35 feet above the level in veins 45 ft. wide, and the stopes south of the cross-cut were extended for 260 feet, being 18 feet above the drive. At 180 feet from the south boundary and 20 feet south of the cross-cut a stope was put up 45 feet above the level in good stone trending west. At 592 feet from the cross-cut in the No. 1 north drive, a cross-cut 30 feet east cut a payable vein 2 ft. wide, on which drives were opened north and south. The main drive was continued to 760 feet, where a dyke or crosscourse was intersected along which cross-cuts were driven east and west. The total length of the north drive was 868 feet. At 430 feet north of the main cross-cut a rise of 40 feet cut a vein 3 ft. wide which yielded over 1 oz. of gold to the ton. At 676 feet from the cross-cut a winze was sunk 22 feet on ore, 98 tons of which yielded 62 oz. of gold. Stoping above this level was continued to the end of 1904.

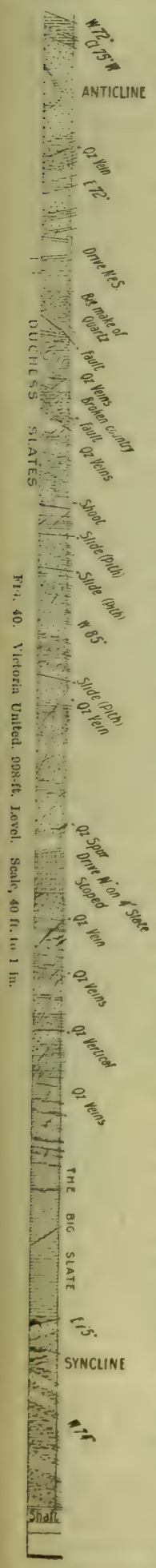



FIG. 40. Victoria United, 998-ft. Level. Scale, 40 ft. to 1 in.

No. 1 south drive was put in along the Victoria line, 4-ft. Slate, which was situated 170 feet west of the shaft. This drive was extended south on a large body of payable stone for 445 feet and stopes above it produced large quantities of payable quartz during 1899.

During 1898 the No. 2 north drive on the Duchess line was driven in a large formation to 230 feet from the shaft, the stopes on this lode yielding good ore.

During 1900, the No. 1 north drive on the Victoria line was advanced to 868 feet from the main cross-cut, the drive trending eastwards to enable the company to work a vein 3 ft. wide east of the main drive. Prospecting drives were opened out east and west on the crosscourse (dyke) to test this portion of the mine, the eastern portion of which was rich at the upper levels. Stoping above the level was continued until 1903. At 780 feet north of the main cross-cut, the eastern cross-cut was extended to 208 feet, intersecting a mineral seam at 142 feet from the north drive. A cross-cut west intersected several gold-bearing quartz veins, during 1904.

*1,098-ft. Level.*—Cross-cutting at this level began in April, 1899. At 70 feet west of the shaft it passed through a flat make of quartz; at 190 feet the Victoria, or 4-ft. Slate belt of country; and at 293 feet a body of stone 7 ft. wide, well mineralized, and gold-bearing. The cross-cut was continued to 400 feet from the shaft.

A well-defined mineral seam in the Victoria, or 4-ft. Slate yielded a 13 oz. patch of nuggets in the north drive along this formation at about 100 feet from the cross-cut. At 260 feet the drive passed through the crosscourse. At 500 feet north a make of stone pitching north, and underlying east, yielded up to 12 dwt. of gold to the ton. This formation was followed for over 120 feet before it pitched underfoot. At 768 feet from the cross-cut a rise was put up on the dyke, and connected with the 998-ft. level. This rise on the 4-ft. Slate passed through several gold-bearing veins, and levels were opened out at 48 feet and 79 feet, above the main drive. At the first of these openings the stone in the north drive was 2 ft. wide, and showed gold; in the second a drive south carried payable ore for 100 feet before holing through to the winze-workings.

A drive south on the 4-ft. Slate, or Victoria line, at 170 feet from the shaft, proved a highly mineralized formation 12 ft. wide; this narrowed down to 2 ft. wide at 178 feet south, but a rise above this point passed through several makes of quartz, some gold-bearing. At 405 feet south, two quartz veins, 1 ft. 2 in. and 1 ft. 6 in. wide, were showing in the face. Above this level several quartz veins were proved by rising. At 275 feet south a vein 3 ft. wide was followed, rising west on an angle of 45° to a height of 50 feet, and proved payable in parts.

No. 2 drive was put in on the Duchess line at 280 feet west of the shaft. No. 2 north drive was in a large flat make of mineralized stone for 120 feet. This was blocked out for a width of 40 feet, and to a height of 20 feet above the level, and carried payable ore. No. 2 south drive carried payable ore for 100 feet, and good ore was followed for 300 feet. Stopes over this drive to the east and west proved the formation within 28 feet of the level, upwards of 50 ft. in width, the quartz veins being irregular in size. At 225 feet south of the cross-cut a rise to the level above passed through several formations, some of which showed gold freely. The stopes above the level passed through a slide or leather jacket that interfered with the quality of the veins, but stoping was continued until 1904.

No. 3 drive was opened north and south at 380 feet from the shaft on the leatherjacket, or Britannia lode. The north drive passed through the crosscourse at 254 feet, after following good ore for the first hundred feet from the cross-cut.

At 10 feet north of the crosscourse auriferous stone 2 ft. wide was worked. At 30 feet from the crosscourse the leatherjacket formation was found in the cross-cut, and the north drive was turned along it. At 455 feet from the cross-cut a large formation was proved, and cross-cuts were put in east and west at this point.

No. 3 south drive on the leatherjacket or Britannia line was driven in a big formation carrying rough gold. At 70 feet south a large vein was struck at 16 feet over the drive in a rise which connected to the level above. Intermediate levels at 30 feet and 50 feet opened payable ore in 1900. In the main drive, at 123 feet, 4 feet of quartz veins were exposed; these continued, and at 208 feet a rise put up on the leatherjacket proved the veins to continue. Stoping on this line began in 1901, and opened up a good supply of quartz, much of which was of low grade.

*1,205-ft. Level.*—This level was opened during 1902. The west cross-cut at 33 feet from the shaft passed through a mineral seam regarded as the Indicator (Fig. 41). The cross-cut, the

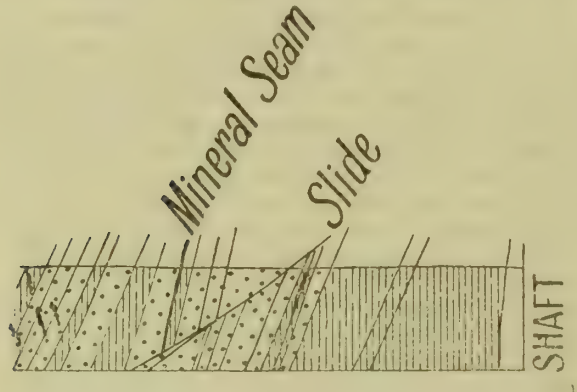



FIG. 41. Section 1205-ft. level, Victoria United Mine.

length of which was 475 feet, passed through the 4-ft. Slate (No. 1 line) at 195 feet; the Duchess Slate (No. 2 line at 340 feet; and the leatherjacket at 460 feet. Drives were extended along the three lines.

No. 1 drive on the 4-ft. Slate carried several quartz veins for 50 feet, where a slide came in on the west side of the drive. A rise at this point intersected, at 29 feet above the level, heavily mineralized gold-bearing quartz, on which drives north and south proved a series of quartz veins, which yielded payable ore during 1905 and 1906. The main drive was continued, and at 225 feet the cross-course was found. Gold-bearing quartz was discovered on the north side of the cross-course, and south of it payable quartz was followed to a height of 60 feet. The main north drive was continued in nice slate, but with little quartz, and at 768 feet north a rise was put up 60 feet connecting with an intermediate level. At 903 feet from the crosscut a slide occurred, which disturbed the country, and was followed to 1,040 feet. At 903 feet north a cross-cut 80 feet west intersected a large formation, along which drives north and south proved fair values for a length of 100 feet.

No. 1 south drive on the 4-ft. Slate was extended for 251 feet, and in 1909 it was continued to 418 feet. A large, well-mineralized vein showing gold was exposed above the drive, some of the ore yielding 6 dwt. per ton.

No. 2 north drive was put in along the Duchess Slates, and at 30 feet north of the cross-cut a rise proved several unpayable quartz veins. At 40 feet over the level a cross-cut west intersected several gold-bearing veins on which drives were extended during 1904.

No. 3 drive, 448 feet from the shaft on the east side of the leatherjacket, was driven north on a promising quartz vein 3 ft. wide, which, however, proved unpayable. At 68 feet north of the cross-cut a rise on the leatherjacket connected to the level above, passing through several payable formations on the east side; stoping on payable ore was commenced from an intermediate level north and south on these veins in 1904. The main drive at 100 feet from the cross-cut intersected payable ore 8 ft. wide, which widened to 40 ft. at 400 feet north, and averaged about 4 dwt. of gold to the ton; the value per ton increased as the drive was extended north, the stone being 30 ft. wide at 470 feet from the cross-cut. At 600 feet north, the ore body was 50 ft. wide, and although mixed with country rock, it did not provide enough waste material for filling the stopes. At 680 feet north a payable formation 40 ft. wide was taken out, and extensive stopes above the drive provided large bodies of payable ore. Payable ore averaging 40 feet wide was followed to 750 feet. A connexion was made to No. 3 cross-cut and No. 1 north drive, which insured good ventilation. Beyond this point the stone, although it maintained a width of 40 ft, was of low-grade to 850 feet. At about 900 feet from the cross-cut the northern end of the lode formation went underfoot. Stoping in this portion of the mine provided large bodies of payable ore till 1911. The No. 3 drive was continued to 1,031 feet north of the main cross-cut without meeting any quartz, but at 20 feet up, a rise in the face passed through a vein 5 in. wide carrying a little gold In 1911 the stopes were let on tribute.

During 1908 a cross-cut was driven east 103 feet from the shaft, and passed through a number of quartz veins, but no attempt was made to test their value.

*1,305-ft. Level.*—The west cross-cut at this depth was opened during 1906. At 40 feet from the shaft it intersected a formation carrying gold, blackjack, and galena. This formation occupied a position relative to the shaft similar to that occupied by the Indicator from the 507-ft. level upwards, and the company, disregarding the effect of intervening folds, classed it as the Indicator (see page 201). The structural features of the mine, however, clearly show that this assumption was wrong. Drives were opened north and south on the formation. The cross-cut was extended to 445 feet from the shaft.

The north drive on the supposed Indicator disclosed at 70 feet a formation 5 ft. wide, but, further driving proved the formation to break into a vein. Payable ore was opened over a length of 340 feet north and south, and for 176 feet the average gold yield per running foot was 30 dwt.

At 60 feet south of the cross-cut good ore was found in the bottom of the south drive on the supposed Indicator, and a winze was sunk on it. Stoping above the level proved this formation to attain a maximum width of 20 feet, and to extend 20 feet over the drive. The results were payable till 1908.

The south drive on the supposed Indicator stopped at 247 feet from the cross-cut in clean country; the north face at 180 feet from the cross-cut showed an unpayable vein.

No. 1 drive north on the 4-ft. Slate at 206 feet from the shaft carried small veins of quartz which showed gold at 150 feet. A rise over this drive intersected a gold-bearing vein at 50 feet, which a drive for 50 feet north and south proved

to be of good value. At 220 feet north a rise passed through a small gold-bearing quartz vein at 31 feet. At 300 feet from the cross-cut two gold-bearing veins were exposed, and various quartz spurs, unpayable though carrying gold, were found between this point and the crosscourse or dyke at 770 feet north. Along the dyke a cross-cut west was put in and connected with No. 2 drive, passing through quartz 2 ft. wide at 86 feet. The main drive was continued to 1,033 feet from the cross-cut, passing through a number of quartz veins. An intermediate drive over the main level was opened from a rise on the western "pith," a large low-grade body being located on the dyke.

The No. 1 drive south on the 4-ft. Slate carried a small payable formation for 100 feet. In the next hundred feet several quartz veins, though gold-bearing, were unpayable.

No. 2 drive on the Duchess line was opened at 380 feet from the shaft. The north drive was put in to intersect a large formation proved to go underfoot in the level above, and at 424 feet north a rise to the level above located it 30 feet below that level. At 245 feet north of the main cross-cut, an east cross-cut intersected a large gold-bearing formation at 77 feet east of the No. 2 north drive, which was turned along this formation on which some good ore was found. Payable stoping was carried out during 1906. At 270 feet north of the east cross-cut a west cross-cut was put out 105 feet, and a gold-bearing quartz vein was followed for 60 feet; a rise over this cross-cut connected with the 1,205-ft. level, passing through some mineralized veins. Stoping over the north drive was carried on from 1908. The drive was continued in low-grade stone to 550 feet from the main cross-cut. At 720 feet north of the main cross-cut No. 4 cross-cut west was put out 200 feet; it passed through a fault and quartz 10 ft. wide at 52 feet; quartz 4 ft. wide at 66 feet; and the leatherjacket at 154 feet.

At 55 feet west of the No. 2 north drive, a drive north was put in, and a body of quartz up to 40 ft. wide was worked north and connected with a cross-cut west from the drive on the 4-ft. Slate. In 1911 this portion of the mine was let on tribute. At 120 feet north of the connecting cross-cut from the 4-ft. Slate drive, the drive intersected a cross-course, beyond which the ore body, though upwards of 30 ft. wide, was unpayable. An angle-break was struck at 165 feet north, and beyond this no quartz was located. The value of the ore mined south of the cross-course fluctuated a great deal, and early in 1914 these stopes were abandoned. A number of cross-cuts were driven west from the main line of workings; these and rises supplied veins which were worked chiefly by the tributers.

A cross-cut driven west from the Duchess line at 130 feet north from the main cross-cut, intersected the leather-jacket at 138 feet. At 60 feet west of the Duchess line a rise put up to the level above intersected several unpayable formations.

*1,405-ft. Level.*—The cross-cut west, commenced towards the end of 1908, passed through some small bunches of quartz at 38 feet, the 4-ft. Slate at 290 feet, the western pith (on both sides of which were small veins) at 289 feet, and a gold-bearing vein at 338 feet. The cross-cut was extended to 420 feet.

A north drive was extended along the auriferous quartz vein intersected by the cross-cut at 338 feet west of the shaft; the results were not encouraging for the first 529 feet, but at this point some small auriferous quartz veins were found, and at 581 feet a quartz vein 4 in. wide was discovered. At 789 feet the drive passed through the "lava" dyke or cross-course. At 960 feet north a cross-cut west passed through a formation 29 ft. wide, which proved to be unpayable, and a rise was put up to the level above. At 1,164 feet north a cross-cut driven east on the cross-course reached the western edge of the formation at 19 feet from the drive; this formation was about 38 ft. wide, and carried about 2 dwt. of gold to the ton. The north drive was continued to 1,271 feet from the main cross-cut in a large body of low-grade ore. An intermediate level was opened above this drive to work the continuation of Clough's block, and bodies of quartz up to 50 ft. wide were stoped during 1913 and 1914, but the quality of the ore was erratic.

At 85 feet west of the shaft a drive was put in south and a rise was put up 20 feet to connect with the winze on the supposed Indicator. An intermediate level proved a formation 10 ft. or 12 ft. in width for a distance of 120 feet, at 36 feet below the 1,305-ft. level; this ore was stoped during 1910, and the drive was continued to 265 feet south, where payable ore, 8 ft. wide, was stoped.

*1,505-ft. Level.*—The cross-cut west at this level was commenced in June, 1911. It passed through a mass of quartz spurs 12 ft. wide, and carrying a little gold at 74 feet; the 4-ft. Slate, which carried quartz 2 ft. wide, at 237 feet; two quartz veins showing gold at 304 feet, and a vein 12 in. wide at 332 feet; the cross-cut was extended to 500 feet west of the shaft.

The quartz on the 4-ft. Slate yielded 3 dwt. 11 gr. of gold per ton.

Drives were put in north and south along the 12-in. vein at 332 feet west of the shaft; the ore won from driving 20 feet north and 27 feet south yielded 50 oz. 16 dwt. of gold, but on driving 84 feet north and 80 feet south early in 1912, the formation became poor. A rise from the north drive connected with a winze from the level above and passed through two gold-bearing quartz veins. In 1914 the north drive was extended to the cross-course at 292 feet. Stoping over the drive yielded crushing material for over six months before values fell away. North of the cross-course the reef was not proved payable, and a rise was put up 38 feet without change.

At 304 feet from the shaft drives 56 feet north and 47 feet south were put in on two quartz veins showing gold; 154 tons of stone were crushed for 21 oz. of gold.

*1,605-ft. Level.*—The shaft having been sunk to a depth of 1,618 feet, the cross-cut west, at 1,605 feet below the surface, was commenced early in 1915. At from 240 feet (the centre of the syncline) to 320 feet numerous quartz spurs were passed through. In the vicinity of a leather-jacket at 290 feet the mass of spurs ranged up to 15 ft. in width of crushing material. At 320 feet a winze was sunk to a depth of 3 feet, but the veins, though all more or less auriferous, not proving payably so, were not further tested, and work ceased at this depth after completing all the dead work, and before the cross-cut reached the Duchess belt of country towards the end of 1915.

The following yields were recorded:—

| Date. | Tons. | Yield | | |
|---|---|---|---|---|
| | | oz. | dwt. | gr. |
| 1895 .. .. | 2,578 | 808 | 18 | 11 |
| 1896 .. .. | 4,178 | 1,454 | 19 | 6 |
| 1897 .. .. | 2,641 | 1,345 | 11 | 18 |
| 1898 .. .. | 13,394 | 7,122 | 10 | 0 |
| 1899 .. .. | 25,661 | 8,675 | 17 | 0 |
| 1900 .. .. | 21,859 | 7,129 | 11 | 0 |
| 1901 .. .. | 23,195 | 7,364 | 2 | 0 |
| 1902 .. .. | 25,156 | 7,399 | 6 | 0 |
| 1903 .. .. | 23,654 | 7,037 | 3 | 0 |
| 1904 .. .. | 28,783 | 8,852 | 18 | 0 |
| 1905 .. .. | 29,792 | 8,879 | 0 | 0 |
| 1906 .. .. | 30,896 | 9,289 | 9 | 0 |
| 1907 .. .. | 32,376 | 12,125 | 8 | 0 |
| 1908 .. .. | 31,140 | 10,479 | 15 | 0 |
| 1909 .. .. | 30,709 | 11,237 | 4 | 0 |
| 1910 .. .. | 27,862 | 8,457 | 15 | 0 |
| 1911 .. .. | 11,820 | 2,829 | 6 | 0 |
| 1912 .. .. | 19,563 | 5,110 | 3 | 6 |
| 1913 .. .. | 20,542 | 6,424 | 9 | 12 |
| 1914 .. .. | 22,800 | 5,511 | 10 | 0 |
| 1915 .. .. | 14,035 | 3,478 | 23 | 18 |

From inception of the company in 1894 up to date of closing down in 1915, the amount of capital called up was £18,333 6s. 8d., and the value of gold produced was £615,000, making a total of £633,333. The chief items of expenditure were—

| | |
|---|---|
| Wages and salaries .. .. | £195,000 |
| Contractors .. .. | £127,000 |
| Tributers .. .. .. | £35,000 |
| Battery costs .. .. | £72,100 |
| Ironmongery .. .. | £43,550 |
| Dividends .. .. .. | £51,000 |
| Fuel .. .. .. | £40,000 |
| Cartage .. .. .. | £21,020 |
| Plant .. .. .. | £9,292 |

## BRITANNIA UNITED COMPANY.

(Pl. XVIII.)

The Britannia United Company was formed in March, 1887, by the amalgamation of the Britannia and Major companies.

### *Structure.*

The section exposed in the Britannia mine is of interest, as it affords an insight into the most easterly portion of the field accessible during the survey, and also a connexion to the Sulieman Pasha line on the west.

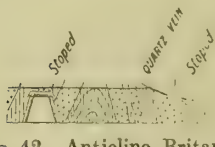



Fig. 42. Anticline, Britannia United Mine, 836-ft. level, 100 ft. east of drive.

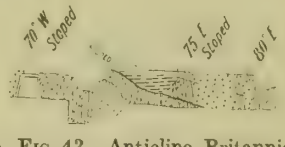



Fig. 43. Anticline, Britannia United Mine, 836-ft. level.

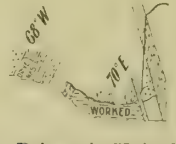



Fig. 44. Anticline, Britannia United Mine, 836-ft. level, No. 1 cross-cut east. Scale, 40 ft. to 1 in.

The strata are folded into a main anticline known as the First Chance at 315 feet west of the shaft at the 836-ft. level (Figs. 42, 43, and 44), with a syncline at 95 feet of the shaft east at the 400-ft. level, 30 feet east of the shaft at the 720-ft. level (Fig. 41), and 50 feet west




Fig. 45. Syncline, Britannia United Mine, 720-ft. level, 30 ft. east of shaft. Scale, 40 ft. to 1 in.

of the shaft, at the bottom or the 1,176-ft level. East of the syncline the eastern anticline shows at the 720-ft. level, 168 feet from the shaft and 75 ft. east of the shaft at the 1,179-ft. level, and this is followed by a roll, with a syncline at 105 feet, and an anticline at 135 feet, as exposed at the 720-ft. level.

The long western cross-cut in the southern portion of the mine, at the 720-ft. level, passed through west-dipping strata to the west of the main anticline for 320 feet. The face was apparently within 5 feet of the repetition of the Indicator on the western dip, for a dark slate, with mineral seams identical with the Telegraph Indicator, as exposed at 60 feet from the shaft, showed at 4 feet from the western face. A westerly list in the axis of the folds is noticeable throughout. The main anticline pitches 3° to 5° to the north in the neighbourhood of the cross-cut.

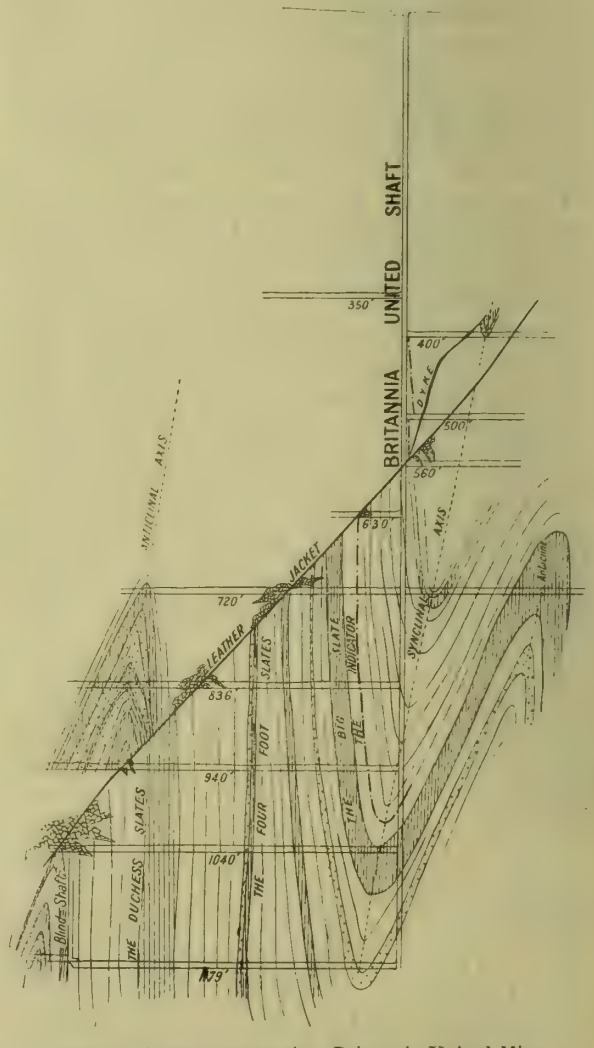



Fig. 46. Transverse section Britannia United Mine (looking north). Scale, 240 ft. to 1 in.

*Correlation of strata with adjacent mines.*—In the west cross-cut, from the south drive on the leather-jacket at the 720-ft. level, a bed of slate on the anticline at 176 feet corresponds with the bed exposed on the anticline in the 700-ft. level, First Chance mine. Owing to the northerly pitch of the fold the slate is underfoot on the anticline at the main cross-cut at the 720-ft. level.

Correlating the strata in the Britannia United and the Victoria United mines, a slight thickening of the beds in the Britannia is noticeable. The wide slate bed at from 37 feet to 82 feet in the 1,040-ft. level of the Britannia United coincides with the slate exposed at from 50 feet to 94 feet in the 1,000-ft. level of the Victoria United. This wide slate (known as the Big slate), which is situated at 15 feet to 20 feet west of the Indicator, is the continuation of the Blocky slate of the New Normanby mine, and on approaching the syncline it tends to thicken. In the 720-ft. level east cross-cut the Big Slate forms in the anticline at 170 feet east of the shaft.

Following the section westwards, the 4-ft. Slate of the Victoria United is exposed at 180 feet west of the shaft in the 1,040-ft. level of the Britannia United, with the Pith belt of country further west.

The Indicator Slate was found in the shaft at the 350-ft. level, and it continued in the shaft to 400 feet. Below the 400-ft. level the Indicator was on the eastern side of the shaft to 560 feet, where a main fault, or leather-jacket, with a displacement of 90 feet, threw the Indicator on the under side of the fault to the west of the shaft. At the 720-ft. level the Indicator Slates, at 55 feet west of the shaft, were driven on northerly, and crushings obtained from a quartz vein yielded upwards of 15 dwt. of gold to the ton for a length of 300 feet. Although the slate was present, pyrites was at times absent or sparsely scattered. The Indicator reaches the syncline at about 1,000 feet from the surface. In the 720-ft. level cross-cut, at 195 feet east of the shaft a mineral seam occurs in the same stratigraphical position as the Indicator on the east limb of the eastern anticline, and a quartz vein at this point carried payable values for a length of 70 feet.

Closely associated with the main leather-jacket fault is a decomposed felsitic dyke ("the pug"), which varies from a few inches to a couple of feet in width. At the 630-ft. level the dyke leaves the main fault, and for a considerable distance continues on a parallel course until reaching the 400-ft. level, where it forms along the bedding and becomes vertical; the dyke here is 1 ft. wide.

*Historical and Details of Workings.*

The Britannia United Company was formed in March, 1887, as the result of the amalgamation of the Britannia and Major companies. The new company increased the size of the shaft down to its full depth, 420 feet, and completed a further sink of 93 feet by the end of 1887. At this depth, 513 feet, quartz was intersected, and a strong inflow of water caused the company to open out at 500 feet, where a cross-cut passed through several east-dipping quartz veins, which showed gold, before intersecting the pug lode. A drive south was put in on the veins found in the cross-cut. A drive south-west on the pug lode was continued along payable quartz from 10 ft. to 14 ft. wide for over 520 feet. Over 700 feet of payable ore was opened south of the cross-cut, and to the north gold-bearing stone, 8 ft. to 12 ft. wide, was stoped for a distance of 150 feet in 1890, 1891, and 1892. A cross-cut east from the north drive proved a line of lode, which was supposed to be the Oregon.

*560-ft. Level.*—During 1888, the cross-cut east was put in at a depth of 560 feet to the eastern lode, where a payable body of ore 6 ft. wide was driven on for a length of over 220 feet. In the north drive cross-cuts proved the lode to be over 60 ft. wide for 200 feet from the main cross-cut, and by the end of 1899 a length of 570 feet of highly payable ore was opened up on the leather-jacket or pug lode; portion of this payable shoot was located south of the cross-cut, where the lode ranged from 7 ft. to 25 ft. wide for a distance of 300 feet, and extended to 70 ft. wide in the stopes. A cross-cut west from the south drive was put in 150 feet. At 340 feet south of the shaft, No. 2 winze, at a depth of 15 feet, intersected highly payable quartz, on which an intermediate level was opened. At 140 feet south of the cross-cut a rise put through to the 500-ft. level intersected good ore at 16 feet.

Development in the north end was retarded during 1889 through the Victoria Company ceasing work, and the water finding its way to this mine. In 1890, a large quantity of gold-bearing ore was opened up over this level. Stoping was continued until 1892.

*630-ft. Level.*—During 1890, a level opened at 630 feet from the surface intersected the lode at 64 feet west of the shaft. A drive was put in south along the lode; at 200 feet south of the cross-cut it met with a slide, which split the formation into two, the eastern, 9 ft wide and showing heavy gold, and the western, 29 ft wide and heavily mineralized. The main drive was extended along the eastern run, but on driving south it was found that the main run of payable gold had not been followed. The main run was located 40 feet west of the drive, and several cross-cuts from the main drive proved the shoot to be 300 feet in length. At 174 feet south of the cross-cut a rise connected with the 560-ft. level. An intermediate drive south from the rise opened up a large quantity of payable ore during 1891.

A drive north along the line of lode was commenced in 1890; it proved large formations, but nothing payable. A cross-cut west intersected a small body of 7-dwt. stone.

Stoping above the south level was continued until the end of 1892.

*720-ft. Level.*—In 1892 this level was opened out, and cross-cutting east and west was undertaken. The west cross-cut interesected a leather-jacket carrying 6 in. of promising gold-bearing quartz, on which a south drive was put in; at 280 feet south a large formation occurred, carrying good gold and well mineralized, and this continued for about 60 feet.

Prospecting was continued throughout 1893, a drive being extended south-east towards the boundary. At 80 feet south of the main cross-cut, and about 20 feet over the level, quartz veins carrying good gold were stoped. A drive was put in north for 240 feet on a well-defined lode of poor quality,

from 3 ft. to 10 ft. wide. A west cross-cut was put in for 491 feet from the south drive on the leather-jacket to intersect the Sulieman Pasha line, but owing to the uncertain position of the old workings the work was suspended, the cross-cut being still in west-dipping strata, whereas the chief workings on the Sulieman Pasha lode were in east-dipping beds.

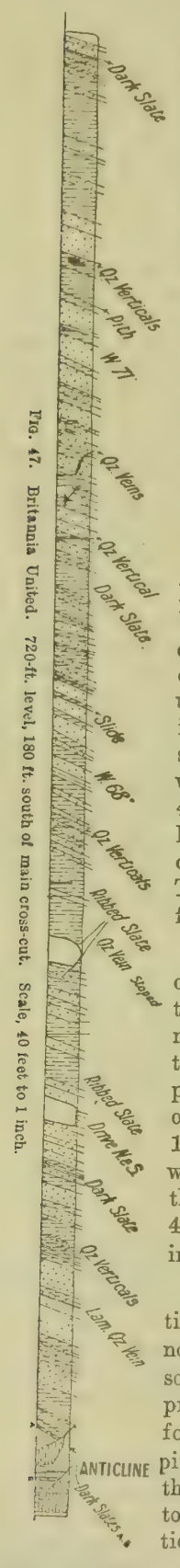



Fig. 47. Britannia United. 720-ft. level, 180 ft. south of main cross-cut. Scale, 40 feet to 1 inch.

In 1909, the east cross-cut was extended, and at 190 feet east of the shaft, a short drive was put in north and south on a payable quartz vein. Further cross-cutting to 310 feet was undertaken east of the main line, but, although the indications were favorable in the face, no rising or driving was carried out.

Above the west cross-cut a large flat make was opened in the "Pith" bed of country during 1910, and some payable yields were obtained; further prospecting in this direction was restricted owing to excisions of the lease.

*836-ft. Level.*—During 1893 the shaft was deepened, and after it had passed through several gold-bearing quartz veins, a level was opened at 836 feet, where a cross-cut west passed through several unpayable formations, each carrying gold; at 236 feet it intersected a series of veins, some of which were payable for the next 40 feet, and at this point the leather-jacket and a large associated body of stone were found. The cross-cut was extended to 303 feet west of the shaft.

A drive north at 236 feet west of the shaft struck, at 8 feet from the cross-cut, a patch of specimens, which yielded 35 oz. of retorted gold, but further driving proved the stone to be poor. Another north drive was opened at 120 feet west of the shaft on stone which yielded 2½ dwt. of gold to the ton from a trial crushing, but 4 dwt. to 19 dwt. in later crushings.

During 1894, several formations were opened up in the northern portion of the mine, but south of the cross-cut very little prospecting was done; the ore found north of the cross-cut pitched southwards underfoot, and the shaft was deepened in order to work the southern continuations of these formations.

*940-ft. Level.*—This level was opened out in 1895, and the west cross-cut was extended to 375 feet from the shaft by July, 1896, intersecting at 227 feet from the shaft a formation in the same channel as that worked in the 836-ft. level.

No. 1 drive was put in 232 feet from the shaft; at 73 feet north, a rise connected with the winze from the level above and passed through several gold-bearing quartz veins. An intermediate level was opened at 25 feet above the main drive.

No. 2 north drive, at 255 feet west of the shaft, proved the lode formation to be 70 ft. wide at 100 feet from the cross-cut. At 175 feet north a cross-course was found, and gold-bearing quartz was followed for 60 feet beyond it. At 209 feet from the main cross-cut, a cross-cut was put in west 14 feet to the leather-jacket.

At 296 feet west of the shaft a third drive followed a formation north, and intersected the cross-course at 87 feet from the main cross-cut; south of the cross-course the ore was from 50 ft. to 75 ft. wide.

Stoping over these drives was commenced early in 1896, but the formations did not extend to a great height; at 34 feet above No. 2 north drive clean country was entered.

South of the cross-cut mineralized stone showing a little gold was found.

During 1897, a formation north of the cross-course, from 20 ft. to 50 ft. wide, and payable, was followed, and connected with the Victoria United Company's mine.

In 1900, the main cross-cut was extended 40 feet to the leather-jacket, on which a rise was put up between two gold-bearing quartz veins, 1 ft. and 1 ft. 3 in. wide.

In 1899, an intermediate level was opened below the 940-ft. level, and driven to the Victoria United boundary. Large bodies of payable quartz were found. Another intermediate level, 30 feet lower, also proved gold-bearing quartz, in 1899. These formations were stoped above the 1,040-ft. level until 1906; they yielded a large quantity of ore, the average value of which was slightly over 5 dwt. of gold to the ton.

*1,040-ft. Level.*—The large formations met with at the cross-cut in the 940-ft. level during 1896 induced the company to resume shaft-sinking. Prior to this a rock drill plant was installed and started in November, 1896.

At 80 feet below the 940-ft. level the shaft passed through a vein of quartz. In March, 1897, a cross-cut west was started at a depth of 1,040 feet from the surface, and extended to 425 feet by July.

At 310 feet west of the shaft a quartz vein carrying a little gold was found, at 380 feet another

formation, also carrying gold, and beyond this a vein 6 in. wide, yielding 1 oz. of gold to the ton. In driving north at the 1,040-ft. level during 1898 and 1899, a large quantity of low-grade ore was opened.




Fig. 43. Britannia United. 1,040 ft. Level. Scale, 40 feet to 1 inch.

In 1899, a winze or blind shaft was sunk from the cross-cut, and several intermediate levels were opened from it. At a depth of 110 feet a large formation was found at 70 feet in the west cross-cut, and a drive south 110 feet proved that it went underfoot. North at 97 feet the lode, which carried payable gold, was cut off by the cross-course. Two winzes were sunk to a depth of 38 feet, and the main blind shaft was also continued to that depth, and connected along the level with the bottom of the winzes, but the stone was poor.

Above the 1,146-ft. intermediate level large formations were opened, but they proved unpayable. In September, 1900, all work from the blind shaft ceased.

*1,179-ft. Level.*—In 1913, the main shaft was sunk to a depth of 1,200 feet, and a cross-cut west at 1,179 feet from the surface connected with the bottom of the old blind shaft. Between 200 feet and 300 feet from the shaft the cross-cut passed through a series of gold-bearing quartz veins, ranging from 1 in. to 1 ft. wide. These veins yielded from 3 dwt. to 7 dwt. to the ton. After connecting with the old workings, prospecting and the extension of the north drive were undertaken, but the results in this portion of the mine were not encouraging.

At 265 feet west of the shaft a drive north on the 4-ft. Slate passed through the cross-course at 250 feet, north of which gold-bearing quartz was found, and a rise put up to connect with the stone left underfoot at the 1,040-ft. level. A cross-cut east was put in at the 1,179-ft. level, during 1916, for a total distance of 181 feet, passing through the eastern anticline at 75 feet, and intersecting a leather-jacket with much quartz at 100 feet, on which a rise was put up 110 feet, also drives north 80 feet and south 108 feet, but values were irregular, ranging from 2 dwt. to 6 dwt. to the ton.

The following yields were recorded from this area:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1863 .. .. | 4,490 | 1,062 | 7 | 15 |
| 1864 (3 quarters) | 2,820 | 468 | 5 | 6 |
| 1865 .. .. | 5,156 | 717 | 5 | 15 |
| 1866 .. .. | 4,265 | 604 | 6 | 5 |
| 1867 .. .. | 2,970 | 528 | 10 | 0 |
| 1868 .. .. | 2,575 | 680 | 3 | 6 |
| 1869 (3 quarters) | 1,484 | 460 | 15 | 12 |
| 1870 .. .. | 2,539 | 613 | 17 | 0 |
| 1871 .. .. | 6,868 | 3,431 | 16 | 3 |
| 1872 .. .. | 2,366 | 609 | 17 | 1 |
| 1873 .. .. | 2,320 | 779 | 6 | 20 |
| 1874 .. .. | 2,406 | 371 | 10 | 7 |
| 1875 .. .. | 2,740 | 517 | 6 | 17 |
| 1876 .. .. | 2,018 | 515 | 19 | 8 |
| 1877 (1 quarter) | 320 | 57 | 17 | 6 |
| 1878 .. .. | 1,264 | 394 | 7 | 15 |
| 1879 .. .. | 1,824 | 342 | 4 | 18 |
| 1880 .. .. | .. | .. | | |
| 1881 .. .. | 248 | 134 | 15 | 0 |
| 1882 .. .. | 1,299 | 173 | 7 | 0 |
| 1883 .. .. | 3,860 | 915 | 7 | 20 |
| 1884 .. .. | 4,856 | 1,560 | 17 | 7 |
| 1885 .. .. | 4,604 | 997 | 16 | 18 |
| 1886 .. .. | 1,357 | 294 | 1 | 15 |
| 1887 .. .. | Britannia United Company formed. | | | |
| 1888 .. .. | 9,559 | 3,578 | 19 | 0 |
| 1889 .. .. | 18,732 | 7,689 | 11 | 0 |
| 1890 .. .. | 25,086 | 7,511 | 0 | 12 |
| 1891 .. .. | 25,379 | 7,598 | 12 | 20 |
| 1892 (3 quarters) | 14,098 | 4,564 | 18 | 20 |
| 1893 (3 quarters) | 6,326 | 3,057 | 6 | 8 |
| 1894 .. .. | 10,111 | 2,782 | 2 | 18 |
| 1895 .. .. | 6,590 | 1,485 | 4 | 9 |
| 1896 .. .. | 16,102 | 3,216 | 18 | 12 |
| 1897 .. .. | 20,557 | 6,069 | 13 | 0 |
| 1898 .. .. | 19,169 | 4,711 | 18 | 8 |
| 1899 .. .. | 13,646 | 3,063 | 11 | 0 |
| 1900 .. .. | 20,721 | 4,749 | 12 | 0 |
| 1901 .. .. | 14,171 | 4,587 | 19 | 0 |
| 1902 .. .. | 13,522 | 3,808 | 13 | 0 |
| 1903 .. .. | 13,807 | 4,162 | 18 | 0 |
| 1904 .. .. | 19,908 | 5,357 | 3 | 0 |
| 1905 .. .. | 20,378 | 4,897 | 3 | 0 |
| 1906 (3 quarters) | 5,418 | 1,308 | 0 | 0 |
| 1907 .. .. | Mine closed. | | | |
| 1908 .. .. | Mine closed. | | | |
| 1909 .. .. | 2,147 | 377 | 11 | 10 |
| 1910 .. .. | 2,045 | 576 | 9 | 0 |
| 1911 (3 quarters) | 315 | 176 | 7 | 0 |
| 1912 .. .. | Nil | | | |
| 1913 .. .. | .. | 31 | 16 | 0 |
| 1914 .. .. | .. | 356 | 2 | 0 |
| 1915 .. .. | .. | 1,018 | 1 | 12 |
| 1916 .. .. | .. | 455 | 19 | 0 |

## NORTH FIRST CHANCE COMPANY.

(Pl. XX.)

*Historical.*

The area held by the North First Chance Company was originally occupied by the Eastern Star Extended Company, which had secured it from the Young Sulieman Company; the Young Sulieman Company, which was formed in 1886 during the Sulieman Pasha boom, sank its shaft to a depth of 520 feet without opening out, and after the collapse of the boom it leased the ground on a 15 per cent. royalty to the Eastern Star Extended Company, the Eastern Star Freehold adjoining on the north-east having payable stone.

The Eastern Star Extended Company began operations in 1891 by driving a cross-cut at a depth of 400 feet. At 355 feet from the shaft a rise passed through 25 feet of unpayable quartz and at 64 feet an intermediate level was opened north for 40 feet from this rise; at this point in the intermediate level another rise of 28 feet met with a slide carrying a little quartz, 27 tons of which yielded 8 dwt. of gold to the ton. The cross-cut east from the top of this rise passed

through a big unpayable lode. The north drive from the top of the main rise was continued to 116 feet, and at the main level a drive north was put in from the foot of the rise.

In 1893 the battery commenced to crush ore won by the company and the tribute parties. Early in 1894, as the yields proved unsatisfactory, the level was abandoned, and the No. 2 level was opened at a depth of 520 feet. At 370 feet from the shaft this level intersected the lode, which was 17 feet thick and poor. A drive north on the footwall of the lode disclosed a patch of gold at 28 feet from the cross-cut, but a trial crushing of 118 tons yielded only 14 oz. 11 dwt. The drive was continued to 130 feet from the cross-cut. At 45 feet north a rise intersected highly mineralized quartz 12 ft. wide and showing gold at 35 feet. In June, 1894, the north drive was connected with the Sulieman Pasha mine, where the lode had been worked 35 ft. wide.

In 1895 a connexion was made to the 635-ft. level of the Sulieman Pasha mine, by means of a winze, and arrangements were made with that company for the hauling of the stone. Trial crushings from the winze proved of variable quality. A drive was put in south on a large body of poor quartz in anticipation of meeting the shoot worked in the intermediate level 30 feet over the back of the level. The stopes over the intermediate above the 500-ft. level produced during 1896 and 1897 a large quantity of ore, which was associated with the "Sediment," the gold occuring in patches. A flat make of quartz rising to the west proved more profitable; this stone, which had formerly been worked by tributers and abandoned, was opened during 1897 to a width of 90 feet; it was cheaply worked by stopes connected with the upper cross-cut, and an average return of under 4 dwt. of gold per ton yielded a profit. Prospecting operations were carried on during 1898 and 1899, the bulk of the payable stone being exhausted at this date.

In 1896 the 780-ft. level of the Sulieman Pasha Company was extended into the Eastern Star Extended ground, and a rise was put up 55 feet at 65 feet south of the boundary. A trial crushing from the top of the rise proved the stone payable, but further crushings were not up to this average, and in November operations from this shaft ceased.

In 1907 the North First Chance Company began operations by prospecting in the vicinity of the old stopes. Small crushings were obtained from solid blocks, but the old ground proved a source of trouble, and after two years' trial the area was abandoned.

*Structure.*

The mine affords an extension of the section of the Ballarat East field beyond the workings of the First Chance mine, and provided the only opportunity of securing data on the west side of the Sulieman lode.

The workings, while shallow, yielded rich returns, the bulk of the gold coming from quartz spurs to the west of the Sulieman lode.

The structure exposed consists of two anticlines and a syncline; the eastern anticline is slightly higher than the western. The anticlines at the No. 2 (520-ft.) level are 110 feet and 210 feet east of the shaft respectively, and the syncline is 150 feet east of the shaft.

The strata consist of alternating slates and sandstones, which have been stratigraphically correlated with those in the First Chance mine to the south of the Big, or No. 9, cross-course. This correlation proves the indicator belt of slate to lie at 330 feet east of the shaft at the 520-ft. level. Above the No. 1 (400-ft.) level extensive stoping was carried out on veins intersecting this belt (on the east dip), and between Nos. 1 and 2 levels south of the No. 1 cross-cut, stopes, 100 ft. wide, are said to exist on the same channel, the characteristic features of which were thin black slates with pyrite seams. The indicator belt on the west dip would be about the plat at the 400-ft. level, but the strata could not be identified owing to the timbering. A southerly pitch of 15° was noted on the anticline.

The quartz forms spurry lodes. The spurs were large, and dipped easterly, and were profitable where intersecting east-dipping beds of the indicator-repeated series. The main, or Sulieman, lode consists of a body of white quartz upwards of 20 ft. wide, pitching south, and lying on a west-dipping fault, or leather-jacket, on which a decomposed dyke, the Sediment, was followed for a distance of 150 feet south of the No. 2 cross-cut. The dyke also pitched southerly, and cut out at 250 feet from the cross-cut, but it was located in the First Chance mine at the 623-ft. level on the south side of the large cross-course. The Sulieman lode above the 520-ft. level would fall along the west-dipping beds, but below this level it intersected east-dipping strata. This portion of the lode was worked by the Sulieman Pasha Company, from which the former occupants of this claim (the Eastern Star Extended) held a tribute to a depth of 780 feet (see p. 161).

The following yields were obtained by the Eastern Star Extended Company:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1892 .. .. | 75 | 29 | 11 | 0 |
| 1893 .. .. | 1,012 | 197 | 1 | 18 |
| 1894 .. .. | 6,936 | 2,117 | 18 | 16 |
| 1895 .. .. | 1,450 | 382 | 2 | 0 |
| 1896 .. .. | 5,997 | 1,481 | 0 | 12 |
| 1897 .. .. | 9,865 | 1,682 | 1 | 0 |
| 1898 .. .. | 979 | 168 | 13 | 0 |
| 1899 .. .. | 580 | 153 | 2 | 18 |

The yields from the North First Chance were:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1908 .. .. | 56 | 11 | 4 | 0 |
| 1909 .. .. | 144 | 28 | 12 | 0 |
| 1910 .. .. | 719 | 204 | 18 | 0 |
| 1911 .. .. | 528 | 125 | 7 | 0 |

The figures supplied by the company were:—
Total crushed to 30th June, 1911, 2,057 tons; gold won, 468 oz. 7 dwt.

FIRST CHANCE COMPANY.

(Pl. XX.)

*Historical.*

The First Chance Company worked an area adjoining the main road, Ballarat East. The claim included ground held partly under lease and partly under miner's right, together with the right to mine under certain private property, paying a royalty on the basis of 5 per cent. of the gold won. In 1898, as the result of a lawsuit, the company obtained the right to mine portion of the Last Chance Company's lease to a depth of 700 feet. In 1896 an agreement with the Llanberris Company secured the right to mine on the Sulieman line of lode above 600 feet.

The company began operations towards the end of 1895. Shaft-sinking was carried to a depth of 125 feet by means of a windlass. The erection of a whim enabled the work to proceed more rapidly, and the shaft was sunk from 12 feet to 18 feet per week down to 200 feet. The first 160 feet was through clay and drift, the shaft bottoming in the worked-out Eureka lead. From 200 feet to the first opening at 313 feet the rate of sinking was from 3 feet to 9 feet per week. In August, 1896, the 352-ft. level was opened, and shortly afterwards the company became self-supporting. Although the area was a small one, operations by the company and tributers were continued with varying success until 1912.

*General Structure.*

The workings gave a unique insight into the structure of the field, as the shaft is less than 100 feet west of the main anticline, which forms the western limit of the Indicator auriferous belt. Although so close to the anticline, and passing through the identical beds which carried auriferous quartz to the lowest level on the eastern dip, the shaft failed to locate an auriferous vein to a depth of 700 feet. The main anticlinal axis, which has a westerly list, is 90 feet east of the shaft at the 352-ft. (No. 1) level, and 35 feet east

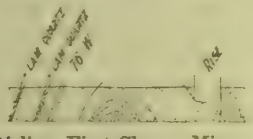



Fig. 49. Anticline, First Chance Mine. No. 1 level, 90 ft. east of shaft. Scale, 40 ft. to 1 in.

of the shaft at the 700-ft. level. At the 352-ft. (No. 1) and 623-ft. (No. 5) levels, the syncline to the west shows at 410 feet, and from this point to the western face, at 675 feet from the shaft, the strata dip east, the Sulieman anticline lying within 30 feet of the face. Overthrust beds are rare, but they occur at the 623-ft. level in the east cross-cut between 100 feet and 150 feet from the shaft. The prevalent dip of the eastern limb of the anticline is from 83° to vertical, and that of the western from 80° down to 60°.

The cap of the anticlinal fold is marked by different features at different positions. The anticline exposed in the No. 1 main cross-cut (352-ft. level) is of a circular or radial type (Fig. 49), while at the same level, at 210 feet south of the

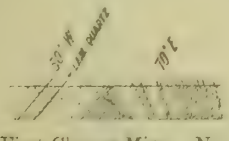



Fig. 50. Anticline, First Chance Mine. No. 1 level, cross-cut 210 ft. south of main cross-cut Scale, 40 ft. to 1 in.

shaft, the anticline in an eastern cross-cut is more acute. The observed southerly pitch of this anticline is 7½ feet in the 100 feet (Fig. 50). At the 424-ft. (No. 2) level the anticline shows in a packed slate, which has wrapped around the broken portions of a sandstone bed (Fig. 51);

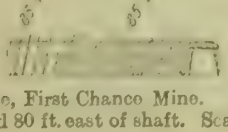


Fig. 51. Anticline, First Chance Mine. No. 2 level, 23 ft. west of drive, and 80 ft. east of shaft. Scale, 40 ft. to 1 in.

here the cap of the fold is flat. At the 502-ft. (No. 3) level the fold occurs in a bed of slate with

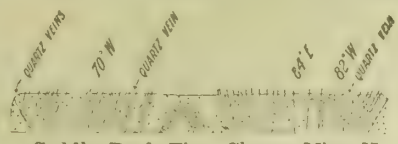



Fig. 52. Saddle Reef, First Chance Mine, No. 5 level, cross-cut west off north drive. Scale, 40 ft. to 1 in.

signs of packing, and at the 550-ft. level a roll on the western dip forms the western limb of an acute fold (Fig. 52); see also the fold at the 592-ft. level, Last Chance mine, 200 feet south from the above (Fig. 57). At the 623-ft. (No. 5) level a slate bed rises to a height of 6 feet in the cross-cut forming a circular cap, underlying a bed of sandstone in

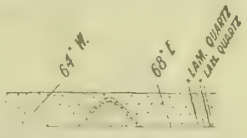



Fig. 53. Anticline, First Chance Mine. No. 5 level. Scale, 40 ft. to 1 in.

which radial fissures or rifts are well developed. At this level a cross-cut driven west from the north drive at 145 feet beyond the large cross-course shows a saddle reef formed on the anticline (Fig. 53). At 410 feet west of the shaft the syncline is well developed, and radial fissures are prominent. The anticline at the 700-ft. level, 35 feet east of the shaft, occurs in a bed of slate of alternating light and dark layers, and this bed is met with on the southerly pitch of the fold (1 in 10) in a cross-cut driven at 6 feet below the south drive at 110 feet from the shaft.

*Strata.*

The lowermost bed exposed on the anticline, at the 700-ft. level, consists of slate, with light and dark layers, and this bed also shows on the east side of the north drive at 345 feet north-east of the shaft after it has been displaced 245 feet by the combined action of the two cross-courses.

Overlying this slate is a sandstone bed 30 ft. wide, with several small slate ribs carrying laminated quartz veins and verticals (exposed on both sides of the anticline at the 623-ft. level). This large sandstone, which reaches the cap of the fold 20 feet above the 550-ft. level, is followed by a bed of slate 8 ft. to 10 ft. wide, above which, for 40 feet, there are thin beds with several laminated quartz formations up to 3 in. wide.

The sandstones and thin slates are followed by a bed of ribbed slate upwards of 40 ft. wide, and known as the Flucan country or Duchess Slate. The plat at the 351-ft. level is cut in this bed, where it dips west. The same bed shows at 50 feet to 90 feet west of the shaft at the 623-ft. level. At the 550-ft. level the Flucan country occurs on the east side of the fold at from 140 feet to 180 feet from the shaft. In this slate, which shows at from 140 feet to 180 feet east at the 502-ft. level, rich quartz spurs have been worked. At No. 1 level, in the south cross-cut, the Flucan country shows at from 70 feet to 110 feet east of the south drive, and a rise above the cross-cut broke through into old workings in the same run of slate. At the 700-ft. level the Flucan country shows in the east face at 130 feet from the shaft, the beds being much compressed below the 502-ft. level.

In the western cross-cuts, at the 352-ft. and 623-ft. levels, the strata above the Flucan or Duchess Slate country are exposed. These strata

agree with the main gold-bearing beds on the eastern dip, but nothing of value was located in either of the cross-cuts.

Between 135 feet and 160 feet west of the shaft at the 352-ft. level a blocky slate occurs, followed by a bed identical with that containing the Indicator on the east dip. The blocky slate shows at the 623-ft. level at from 250 feet to 270 feet west of the shaft, and is followed by a black slate ¼ in. wide with pyrites at 290 feet. At 320 feet other black slates with small laminated quartz veins, which agree with the Pencil Mark country, occur, and the belt of country is repeated between 500 feet and 560 feet from the shaft on the eastern beds of the syncline. This belt of country is exposed at from 330 feet to 350 feet in the 520-ft. level of the North First Chance workings, where very extensive stoping was carried out on quartz veins which intersected the bed above the No. 1 level.

*Faults.*

Two leather-jacket faults occur, one at the 424-ft. level, and the other at and above the 623-ft. level On reaching the anticline both merge into slides, and the quartz which accompanies the fracture in the east-dipping strata ceases. The strike of the leather-jackets is north to N. 10° E. At No. 6 (700-ft. level) a fault in the anticline is almost vertical, and strikes parallel to the fold. Slides along the bedding planes are common; the most important fault of this type, known as the Flucan, occurs in the eastern workings, and has been followed on account of the enrichment of the quartz spurs along its course.

Two parallel cross-courses (Nos. 9 and 10 of Lidgey) occur to the north of the shaft on both the Sulieman and the main belt of country. The combined horizontal displacement by these cross-courses was 240 feet, of which 20 feet only is attributable to the smaller, or No. 10; the combined vertical movement is under 20 feet (see Pl. XX).

*Quartz Formations.*

The quartz occurrences in the mine are remarkable, as practically all the strata on the eastern dip for a width of 200 feet from the anticline are favorable for gold, and the quartz spurs are enriched on both sides of the main Flucan, which lies about the middle of the favorable belt. The chief bodies of quartz were confined to the leather-jacket faults, but spurs having no connexion with any faulting were worked.

Large spurs occur both above and below the leather-jacket, and these extend into the adjoining strata for 50 feet and 60 feet in some places; the nearer to the anticline the larger are the quartz makes.

Auriferous quartz spurs from ½ in. to several feet thick occurred in the east-dipping strata for a distance of 200 feet from the anticline. Some were confined to a single bed of slate, but others were continuous for 20 feet or 30 feet. The gold contents in quartz spurs intersecting favorable beds were concentrated at the points of intersection; this feature was conspicuous in the large sandstone bed between the Nos. 5 and 6 levels. Gold crystals were common in the quartz spurs in contact with certain sandstone beds. Where the quartz spurs on the Flucan were faulted, gold values were highest near the fault.

On the Sulieman line of country at 640 feet west of the shaft, a large formation accompanied a leather-jacket fault; it consisted of south pitching blows of quartz upwards of 20 feet wide and from 10 feet to 20 feet high. Some of the payable quartz was stoped above the level, and a connexion was made with the old workings of the Llanberris No. 3 shaft. The main cross-cut passed through a decomposed dyke (the "sediment") 8 in. wide at 633 feet; this dyke was located in the stopes, but it did not extend further than the little cross-course. A striking feature in the workings on this lode was the repetition of the main Flucan or Duchess Slate belt of the eastern workings, and found in the vicinity of the richer stone. The main fault which had a strike of N. 5° E., intersected strata striking north and south; the intersection had a southerly pitch to which the shoots of gold conformed. Owing to the terms of the agreement under which the work on this line was carried out, sinking below the level could not be undertaken, and the downward extension of the payable stone was left unworked.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1897 .. .. | 738 | 491 | 19 | 16 |
| 1898 .. .. | 967 | 374 | 2 | 18 |
| 1899 .. .. | 1,881 | 583 | 1 | 0 |
| 1900 .. .. | 2,769 | 740 | 5 | 0 |
| 1901 .. .. | 1,448 | 348 | 14 | 0 |
| 1902 .. .. | 4,275 | 1,954 | 2 | 0 |
| 1903 .. .. | 5,169 | 1,884 | 4 | 0 |
| 1904 .. .. | 864 | 244 | 0 | 0 |
| 1905 .. .. | 6,769 | 2,650 | 3 | 0 |
| 1906 .. .. | 8,040 | 3,334 | 1 | 0 |
| 1907 .. .. | 5,644 | 1,785 | 1 | 0 |
| 1908 .. .. | 3,620 | 1,188 | 7 | 0 |
| 1909 .. .. | 2,642 | 869 | 4 | 0 |
| 1910 .. .. | 2,652 | 704 | 1 | 0 |
| 1911 .. .. | 2,635 | 317 | 5 | 0 |
| 1912 (3 quarters) .. | 517 | 142 | 1 | 0 |

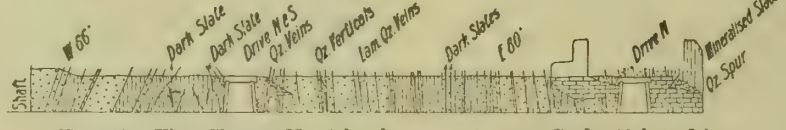



FIG. 54. First Chance, No. 6 level, cross-cut east. Scale, 40 ft to 1 in.

At the 700-ft. level a large quartz formation occurs in the fissured anticline; it was poor at this point, but when it was followed upwards a leather-jacket was met with, and the formation, when crossing the east-dipping strata, was payable.

In the cross-cut west from the north drive at the 623-ft. level is a small saddle reef on the anticline (Fig. 52); this formation is identical with Dunn's lode in the Britannia mine to the north, and Robert's lode in the Llanberris mine to the south.

The total output from this claim till operations ceased in 1912 was 81,737 tons, which yielded 20,418 oz. of gold. Dividends amounted to £6,750.

LAST CHANCE UNITED COMPANY.

(Pl. XIX.)

The Last Chance United Company, which was formed in June, 1889, took over the assets of the Last Chance Tribute Company, which had been registered on the 8th of May, 1882. The previous occupant of the area was the Endeavour Company

which had begun operations in 1864. Earlier than this the Last Chance Quartz Mining Company, formed in 1859, had mined portion of the area.

The longevity of operations within a comparatively small area and to a depth of 1,200 feet only, is one of the striking features of the Ballarat East field. For a continuous period of nearly 50 years, from 50 tons to 500 tons of quartz have been crushed per week. The yield per ton was

prospecting operations were carried out on the southern boundary at the 789-ft. level on the veins in the neighbourhood of the leather-jacket lode (Fig. 55). The new company has carried out systematic search, but so far has failed to locate permanent payable bodies of stone to date, 1916.

*Historical.*

In 1887 the mine was being worked by tributers, but this arrangement was not satisfactory,

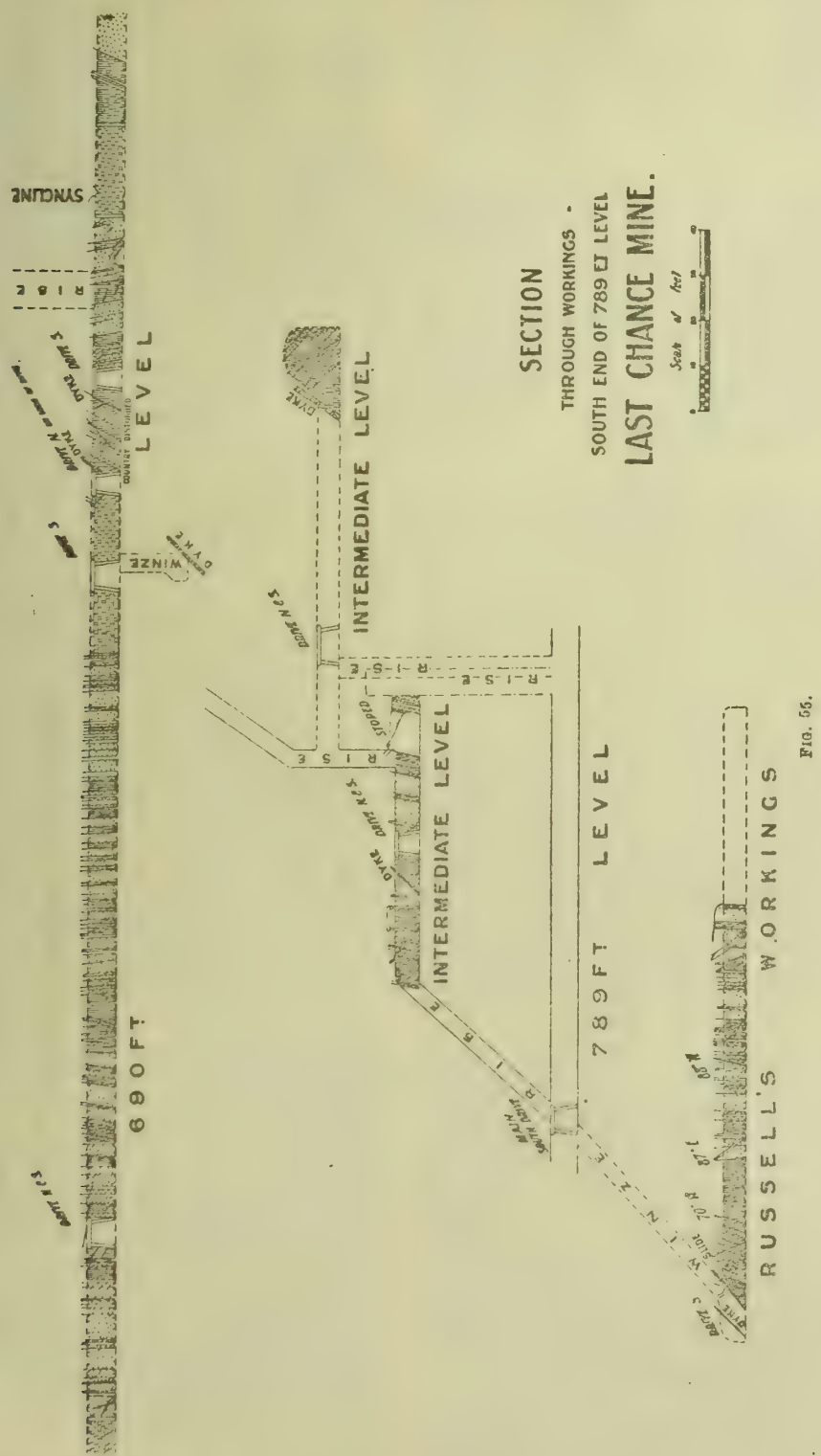



Fig. 55.

markedly different from that in the adjacent Llanberris mine, but this was accounted for by the smaller tonnages put through by the Endeavour and Last Chance companies.

From 1882 to 1910 operations were uninterrupted, but then ceased while the company reconstructed. Work was resumed in 1911 when

and the whole of the mine to the 340-ft. level was let under a percentage agreement to Henley and party. During this year a Government grant was allotted to the company to enable deeper sinking to be undertaken, and by the end of the year the shaft had reached a depth of 450 feet with a

level opened out at 433 feet. Work at the 340-ft. level was confined to Robert's lode, where the country was hard and low-grade quartz carrying 2½ dwt. of gold to the ton was worked. By the end of 1887 the company purchased several private properties, as well as claims held by the Star and the Pride of the East Companies, on which shafts to a depth of 300 feet had been sunk, as the tribute party was successful in locating a body of stone 3 ft. to 4 ft. wide, and averaging 10 dwt. of gold to the ton at the 340-ft. level. The main shaft at 370 feet from the surface passed through a lode 2 ft. wide, underlying west. This was supposed to be a continuation of the Oregon lode, which was being successfully worked in the Britannia mine on the north.

In 1888 several additional freeholds were added to the company's area, and work at the 433-ft. and 340-ft. levels was prosecuted with vigour. At 155 feet west of the shaft the 433 ft. (No. 3) level passed through a big body of quartz (Meanowski's lode) with much water, and west of this the "pug" and flat veins. Drives were put in north and south on this formation, and meanwhile the cross-cut west was extended to cut the Indicator. Meanowski's lode yielded good returns for several years.

In July, 1889, the Last Chance Tribute Company was wound up, and the Last Chance United Company was formed to work the area. The 340-ft. (No. 2) level was now worked on wages, while the 433-ft. level was let on tribute. During the half-year ending November, 1890, the first dividend of 1s. a share was disbursed. Large bodies of ore were opened up and crushed during succeeding years, and occasional dividends were paid. In 1889 the shaft was deepened, and early in 1890 the 494-ft. (No. 4) level was opened. Towards the end of 1890 a big lode was intersected at the 494-ft. level. During 1891 the 592-ft. (No. 5) level was opened. The mine at this time looked remarkably well, large bodies of payable ore being worked at several levels, and regular dividends being paid. The battery was not of sufficient capacity for handling large quantities of ore, and it was therefore enlarged towards the end of 1892. An increased tonnage was then dealt with for fair average results.

In 1893 a new formation 5 ft. wide was discovered in the 592-ft. level. More freeholds were purchased, and notwithstanding loss during the financial crisis in the Colony at that time the mine continued to pay dividends. During this year a formation 10 ft. wide at the No. 5 level yielded 14 dwt. of gold to the ton. Payable quartz was worked at the Nos. 2, 3, 4 and 5 levels, and an additional ten heads of stampers were added to the battery. Early in 1894 the shaft was deepened and the No. 6 level was opened before the end of the year. New winding gear and steel ropes were added during this term.

In 1895 larger quantities of quartz were crushed, and the average value per ton began to fall away. Dividends, however, were paid regularly. Portions of the mine below the 433-ft. level were now let on tribute. During 1896 both tonnage and gold yield began to decrease, and consequently dividends were irregular. The shaft was deepened to 888 feet early in 1897, and a chamber was cut at that depth. In 1896 the Nos. 6, 5, 4, 3 and 2 levels all supplied crushing material, a large lode at the No. 4 level yielding much ore. Although the tonnage was smaller the values fluctuated during 1897. Dividends were paid, and an air compressor, &c., was installed. By the end of the year the main shaft had reached a depth of over 1,000 feet, and a cross-cut was opened west at the 985-ft. level. In 1898 a large body of payable stone was discovered at this level, and dividends were again paid after they had ceased for six months. During 1899 a large output was maintained, but by the end of the year the average values fell away and dividends ceased.

In 1900 the main shaft was sunk to 1,085 feet, and a cross-cut was driven west to intersect the lode, which had gone underfoot at the 985-ft. level. This cross-cut, however, did not meet with the result anticipated, and towards the end of 1901 a rise above the 1,085-ft. level proved that only a thin crust of quartz lay below the 985-ft. level. An intermediate level below the 985-ft. level was opened early in 1902, and a small dividend was paid from an increased gold yield, but this success was not continuous throughout the year. Prospecting operations were carried on in a block of ground secured from the Llanberris Company, but before any payable formation was found a large flow of water necessitated the building of a brick dam and the cessation of work in the cross-cut. Fair stone was crushed during 1903 and 1904, but the results did not cover working expenses, and calls were therefore made. In 1905 the shaft was deepened another 100 feet, and a level was opened at 1,192 feet. Trial crushings from two makes of quartz passed through in sinking yielded 2½ dwt. of gold to the ton.

In 1906 a level was opened at 789 feet, and a western cross-cut was put in from which a rise connected by means of an intermediate level to a winze below the First Chance 700-ft. level; this winze was 22 feet in depth, and at 25 feet to the west of it a make of stone, yielding 6 dwt. of gold per ton, was found. The intermediate drive was on the western side of the anticline, and the bulk of the ore was unpayable. Work in this part of the mine ceased at the end of 1907.

A rise was put up on the Pug lode at the 789-ft. level; the quartz below the slide was poor, but at 45 feet it carried a little visible gold along the slide, although it was unpayable. At No. 2 rise, 170 feet further south, some strong quartz veins carrying good gold values were worked, while the south drive was being repaired and a cross-cut driven east to work the same line of country. A few small quartz veins, carrying gold, was intersected by the cross-cut. In 1909 Nos. 1 and 2 rises were connected by an intermediate level, and large formations carrying fair values were stoped for a couple of years. The cross-cuts from the main south level disclosed large quartz spurs and formations up to 40 ft. wide; trial crushings from these sometimes gave payable results, which, however, were not maintained when stoping began.

*Structure.*

The Last Chance mine, together with the adjacent First Chance and North First Chance mines, affords a section extending from the anticline east of the Indicator belt to a considerable distance west of the Sulieman anticline (Fig.

56). This is the best available section illustrative of the structure of the Ballarat East field.

1,192-ft. level, but this is apparently only a minor roll. No pitch is noticeable on any of the folds.

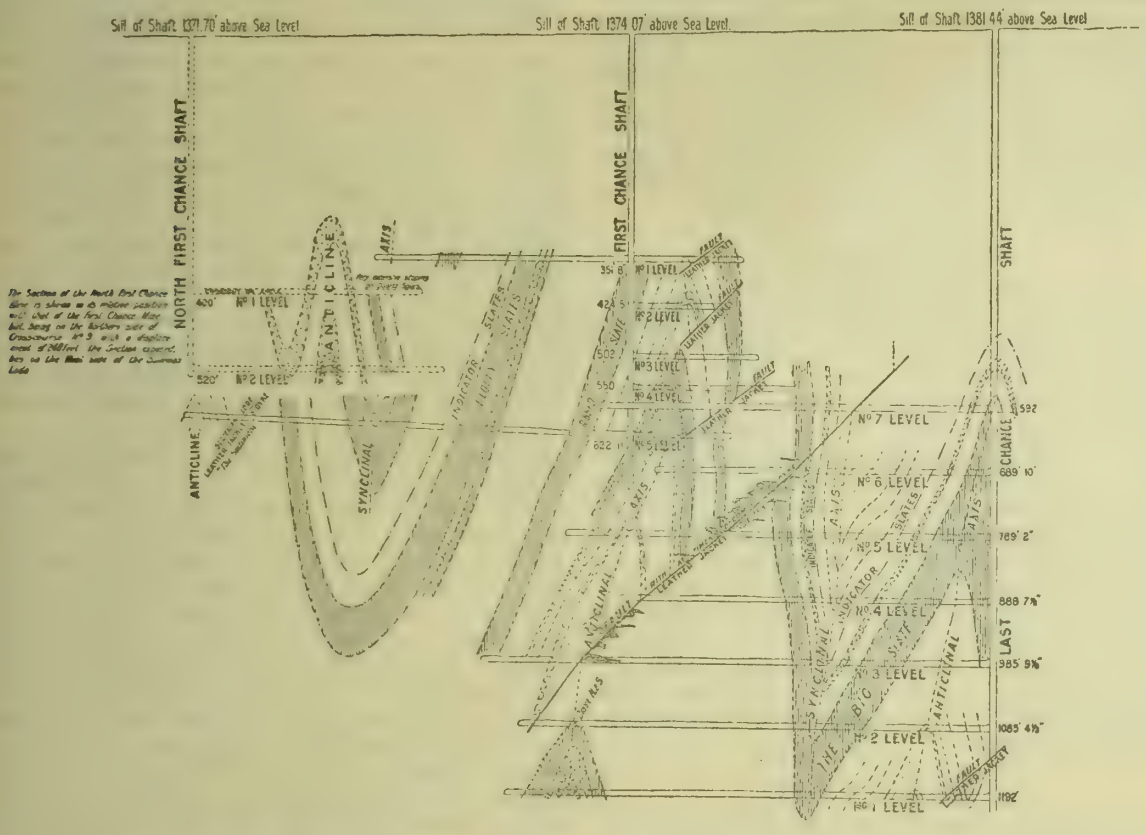



Fig. 56. Generalized section of the Ballarat East Goldfield. Scale: 300 ft. to 1 in.

The chief structural feature in the Last Chance mine is the main anticline at 490 feet west of the shaft at the 592-ft. level. This fold, which is named the First Chance or Indicator anticline, has a marked westerly list, but not so marked as

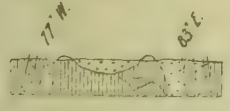



Fig. 57. Anticline, Last Chance Mine. No. 5 Level, 570 ft. west of shaft. Scale: 40 ft. to 1 in.

in the mines to the north. It is exposed at 570 feet west of the shaft at the 789-ft. level, and at 620 feet west at the 985-ft. level; at the latter point it was intersected by the main leather-jacket fault (the Pug or Britannia lode), which carried a large body of highly payable quartz. Under the leather-jacket (slide) the anticline shows at 640 feet west of the shaft at the 1,085-ft. level, and at 650 feet west at the 1,192-ft. level.

The syncline to the east of the First Chance or Indicator anticline shows at 225 feet west of the shaft at the 690-ft. level, and at 275 feet west at the bottom or 1,192-ft. level. The list of the synclinal axis is less rapid than that of the anticline.

East of the syncline an anticline, which was met with only in this mine and in the Britannia and Victoria United mines to the north, shows in the plat at the 592-ft. level; it has a westerly list to 120 feet west of the shaft at the 1,192-ft. level. There is a small syncline to the east of the eastern anticline at 40 feet west of the shaft at the

*Faults.*

Good examples of both strike and dip faults occur in the mine. The pug, leather-jacket, or slide associated with the main quartz occurrence in the mine is a west-dipping fault agreeing roughly with the strike of the strata. Above the 889-ft. level a felsite dyke often accompanies the fault, but does not always keep in contact with it, being somewhat erratic in its course and having a tendency to assume a more vertical course as in the stopes above the 789-ft. level. A parallel leather-jacket 400 feet east of the pug crosses the shaft below the 789-ft. level, and is seen at 190 feet west of the shaft at the 1,085-ft. level. Some quartz is associated with this fault, but the amount is negligible, as this part of its course is located in west-dipping strata. Below the 1,192-ft. level this fault will enter east-dipping beds, and the quartz occurrences should be of larger dimensions.

Another type of strike faults, the piths, are true slides agreeing in strike and dip with the enclosing strata. These are usually met with in the vertical beds forming the eastern limb of the anticline. The amount of displacement of the quartz spurs by these piths varies, but they seldom amount to more than a few feet. Gold values occur in the vicinity of the piths, which are regarded as of the nature of indicators, but no relationship can be assigned to the feature, as the piths are in every instance of later age than the quartz veins in which the gold occurs.

Two well-marked parallel dip faults (cross-courses) pass through the mine workings. The movement on these faults varies considerably. On the small cross-course the heave is 20 feet, with a

throw of 10 feet, while on the large cross-course 60 feet to the north the heave is 240 feet. As the movement is a horizontal one, the throw is apparently negligible, but as little work was in progress at the time of the survey in this vicinity, the amount could not be ascertained. It is noteworthy, however, that, in the upper levels in this mine, the lodes, as worked north of the big cross-course, were not the displaced lodes, but that owing to the faulting, lines to the west of those driven on the south side were brought nearly opposite by the movement of the fault.

*Quartz Occurrences.*

Lodes and spurs in association with the pug or leather-jackets; spurs irregularly distributed; and verticals or laminated bedded lodes are the quartz occurrences in this mine.

The bulk of the gold won has come from the one leather-jacket lode, which, dipping west, has cut through east-dipping strata to about 300 feet, and the lode to this point was proved payable by the early companies. West-dipping strata followed to near 500 feet, no values showing in the lode, and then east-dipping strata to just below the 985-ft. level, with alternating rich and poor formations. The richer ore was above the 689-ft. level in the vicinity of the Indicator; above the 789-ft. level on the western Indicator, and at the 985-ft. level, near the anticline. The width of payable quartz, details of which are given below, varies.

*Details of Workings.*

*260-ft. (No. 1) Level.*—Work at this level ceased early in 1887, no success attending the efforts of the tributers in extending their cross-cut 120 feet during the half-year.

*340-ft. (No. 2) Level.*—Working on Roberts' lode during the early part of 1887, the tributers found the country hard. Trial crushings gave only 2½ dwt. of gold per ton, but before the end of the year the quartz widened to 3 feet or 4 feet and averaged 10 dwt. of gold per ton. In 1888, it averaged 8½ dwt. A main rise was repaired up to the 260-ft. level for an air course, and a winze was sunk below the level on a shoot of stone which was described as follows in the manager's report:—"This lode (Roberts') is of a saddle formation, and is 6 ft. wide, with here and there a horse of slate between the stone." This stone yielded 6 dwt. of gold per ton. The western country at No. 2 level was prospected during 1888 by Ruckman and party, but was found to be poor. Davis and party worked the Meanowski lode at No. 2 level with fair results; meanwhile a prospecting drive for the Oregon lode was put in.

In July, 1889, the tribute arrangement ceased, and the level was worked on wages. A drive was extended along a large body of stone dipping underfoot going south, but, as this formation was more easily worked from the stopes above No. 3 level, No. 2 level was abandoned until it was repaired in 1892. The north drive was extended through the big cross-course, on the north side of which a lode was found, but it was poor. By driving east 50 feet payable stone was intersected, pitching fast to the south. The stopes provided plenty of ore, and five parties of tributers were at work on the level for many months. Towards the end of 1893 a flat make of quartz, about 2 ft. wide, was being blocked for a length of 50 feet south of the cross-cut. North of the big cross-course plentiful, but poor, ore was found. In the south workings a cross drive and rise cut the large flat formation mentioned above, and provided an easier means of handling the ore.

During 1895 the large flat formation and smaller quartz veins yielded ore of variable quality. Early in 1896, the veins became smaller, but towards the end of the year the extension of the south drive proved veins from 2 feet to 5 feet wide, which yielded from 5 dwt. to 15 dwt. of gold to the ton. North of the cross-cut the quartz worked in the stopes was small, but of fair quality. From 1896 till the end of 1901, continuous work was carried out at this level by drives and stopes on flat quartz veins, which were payable though small at times. The greater part of the work was north of the main cross-cut. Towards the end of 1901 operations were resumed in the south end on fair-sized bodies of payable quartz which gave remunerative results until work in the level was finally suspended towards the end of 1904.

*433-ft. (No. 3) Level.*—Work at this level commenced at the end of 1887 by cross-cutting west, a 2-ft. lode underlying west, having been cut in the shaft at 30 feet below the No. 2 level. At 155 feet west of the shaft the cross-cut intersected a big formation with much water, and west of this the "pug" with flat quartz veins. Drives north and south were opened out at 140 feet from the shaft. Towards the end of 1888 a trial crushing from the north drive yielded 10 dwt. of gold per ton; the lode was named the Meanowski lode after the chairman of the company. A tribute party extending the north drive on this lode worked the quartz veins to a width of 25 ft., and obtained an average of 8½ dwt. of gold to the ton. After twelve months' work, Grainger and party found that the country became harder, and that the stone pinched, so that when the company was re-organized in July, 1889, the tributers gave up. Wages men now took the tributers' place and extended the north drive chiefly in slate country, following the pug to the big cross-course at 674 feet north of the cross-cut. Soon after the mine had been taken over from the tributers the stone in the south end at No. 3 level, which had yielded so well and which ranged from 20 ft. to 30 ft. wide, pitched underfoot. In 1891 the drive was extended north of the cross-course on the course of the lode. For over 300 feet the lode was 3 ft. to 8 ft. wide and payable, and quartz veins, from 4 in. to 1 ft. 6 in. wide carrying good gold, extended upwards of 20 feet from the hanging wall. Stoping north and south of the big cross-course supplied payable ore. Between the two cross-courses (*i.e.*, south of the big cross-course) the lode varied from 3 ft. to 6 ft. wide, and veins extended 30 feet into the hanging wall; stopes to a height of 60 feet supplied good payable stone during 1891. North of the big cross-course, ore 25 ft. wide was stoped 20 feet high in the same period. The size and value of the lode in the stopes were maintained till the middle of 1893, when the ore became poor and work was confined to the quartz spurs only. Attention was also paid to a make of flat quartz veins 150 feet west of the big lode which was giving good returns. These flat veins and the spurs west of the big lode were worked till the middle of 1896, but, as a rule, with rather poor results.

Early in 1901 work was resumed at this level; the cross-cut was cleaned out and extended to intersect the extension of the belt of country which was then being so profitably worked by the First Chance Company. Results were unsatisfactory, and by the end of 1902 connexion was

made to the First Chance mine on a vein which was unprofitable in the Last Chance mine, though remunerative in the First Chance. Twelve months' prospecting failed to open up payable veins. A rise was put up on the Indicator in 1904, and further prospecting in the south end of the mine was carried on, but although large formations in promising ground were opened and tried, nothing payable was found and the level was abandoned in 1905.

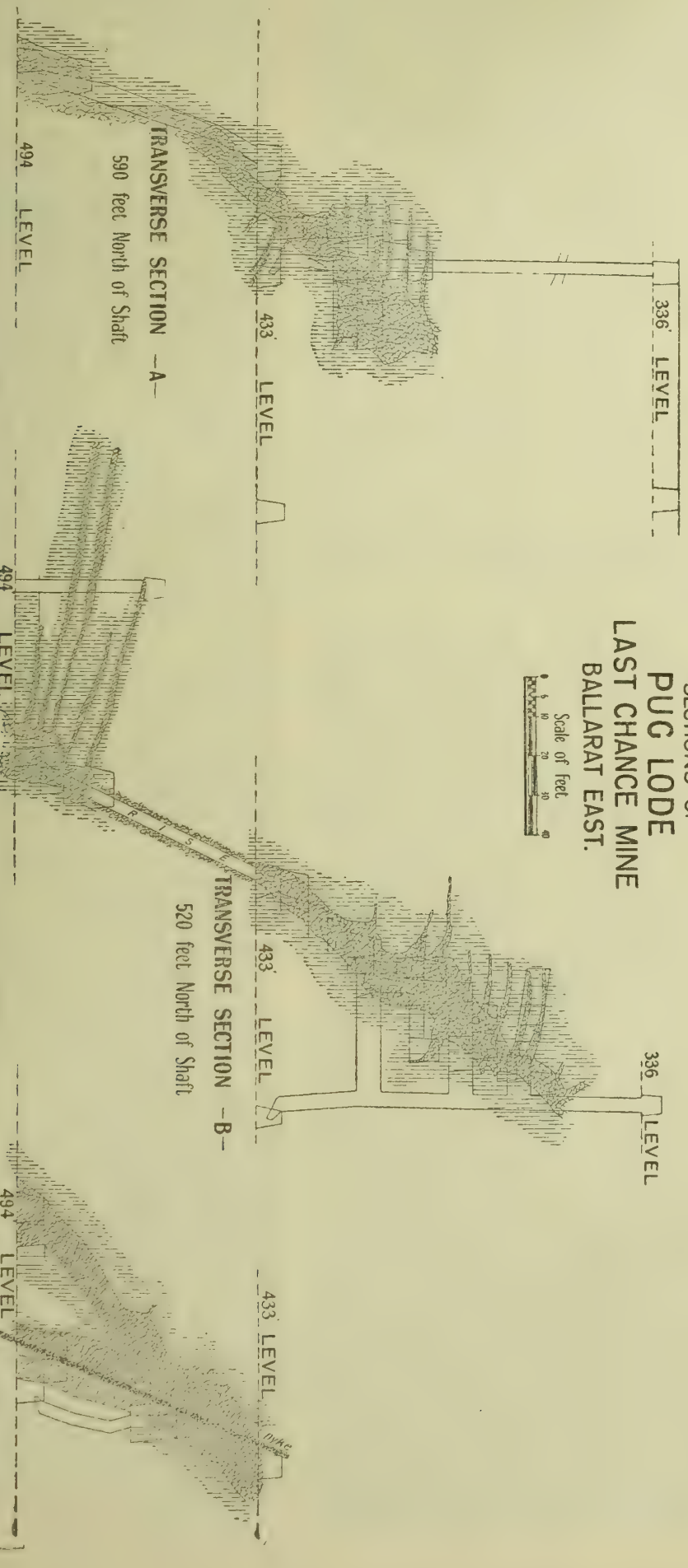



FIG. 68.

*494-ft. (No. 4) Level.*—Work at this depth began in 1890. At 170 feet west of the shaft this cross-cut passed through the pug which, however, was not associated with quartz at this point. A drive south was started on the pug and leaders were soon found. In the main cross-cut west of the pug a big lode 40 feet wide was discovered; the first 20 feet was very poor "buckstone," which was followed by well mineralized quartz averaging 3 dwt. to 6 dwt. of gold to the ton in the drives north and south for 80 feet. About 100 feet south of the cross-cut a big body of quartz came into the drive; this continued to 340 feet. Stoping from an intermediate level proved a lode up to 30 ft. wide averaging 6 dwt. to 8 dwt. of gold to the ton. The main north drive on the course of the lode was extended to 415 feet, and a cross-cut was put in to intersect the shoot of gold which pitched underfoot from No. 3 level north. The main drive carried a lode 8 ft. wide which showed gold in breaking beyond the little cross-course. After passing the big cross-course the lode was 6 ft. wide and consisted of quartz and slate with quartz veins going into the hanging wall; these veins were 4 in. to 1 ft. 6 in. wide and carried good gold values. By the end of 1892 the north drive had reached a point 940 feet from the cross-cut; the lode ranged from 2 ft. to 6 ft. wide, but was small in the face. Stopes on the lode and veins supplied plenty of crushing material, some of the veins being worked 100 feet west of the lode still carrying gold.

In 1893 blocking on the veins had reached 130 feet west of the main lode, the stopes on which were now about 40 feet high. By the close of 1893 the block of quartz between the cross-courses was stoped above No. 4 level through to No. 3 level. A little stoping only was done north of the big cross-course, but south of the little cross-course stoping was carried on till the end of 1896 on a lode from 20 ft. to 30 ft. wide: and veins from 6 in. to 2 ft. wide, which in the hanging wall extended 40 feet to 50 feet from the lode, carried good gold values. Subsequently the lode in the stopes became smaller and poorer, but the veins maintained a good average value. The ore in the south end remained about payable till the end of 1899, but that in the northern stopes was irregular and poor, and although prospecting was carried out nothing payable was located after June, 1898, till work ceased three years later. The south stopes were connected with the Llanberris No 1 Company's workings towards the end of 1891, but the value of the stone was so poor that these stopes were abandoned and work in the northern drive was resumed in 1902, when a rise was put up 160 feet from a point 800 feet north of the cross-cut. In this rise, which connected with No. 2 level, unpayable quartz was found. A cross-cut was driven 140 feet to intersect a body of stone left some years before, but when this was intersected early in 1903 it was found to be poor; it improved as work proceeded, but failed to become payable. In the south end some veins were worked which carried good gold for a time during 1903. In 1904 the main west cross-cut was extended, and several bodies of quartz, which on testing proved unpayable were passed through, but nothing payable was discovered. The cross-cut was stopped at 540 feet from the shaft in May, 1905, and a rise was put up to intersect the First Chance belt of flat vein country.

*592-ft. (No. 5) Level.*—Operations at this level began about September, 1891; the west cross-cut at 200 feet from the shaft passed through a lode formation, on which a drive north proved a body of well-mineralized quartz for a distance of over 200 feet, yielding from 4 dwt. to 8 dwt. of gold to the ton. During 1892 ore 1 ft. 6 in. wide, and carrying 8 dwt. of gold to the ton, was blocked out in the north drive at 229 feet from the cross-cut.

During 1893 the main cross-cut was extended from 400 feet to 650 feet. It passed through several bodies of quartz, drives on which gave payable yields until the stone pitched underfoot; one make 10 ft. wide yielded 14 dwt. of gold to the ton. The main north drive carried a formation 14 ft. wide, and payable as far as the little cross-course; the stopes also yielded plenty of good crushing material. On the little cross-course a drive put in east passed through a vein 10 in. wide, showing good gold before it stopped 120 feet east of the main north drive. North of the big cross-course the lode in the drive was small for about 100 feet. Drives north on the western lode proved a quartz reef 4 ft. wide, but yielding only 2 dwt. of gold to the ton; a trial crushing from an opening to the south gave 5 dwt. to the ton. The south drives on the big lode, which was 20 ft. to 30 ft. wide, yielded plenty of quartz. Several rises were put up and connected to the No. 4 level. During 1895 the lode above the No. 5 level averaged 30 ft. wide. North of the little cross-course the lode averaged 20 ft. wide of payable ore. In 1896 a drive was put in north and south on the Indicator line on quartz from 2 ft. to 3 ft. wide, with veins going into the hanging wall, and carrying good gold.

Several drives east and west of the pug were extended during succeeding years, and large bodies of quartz, some of low grade, were worked. During 1899 the stopes at the south end yielded large quantities of low-grade ore as a rule, but rich spurs on the hanging wall helped to maintain a payable average till the end of 1903. In 1904 the south stopes were connected with the Llanberris No. 1 mine, but the ore was poor, and prospecting showed no improvement.

*689-ft. (No. 6) Level.*—Work began at this level during the latter part of 1894. At 210 feet west of the shaft the cross-cut intersected a formation 60 feet wide, consisting of quartz, intermixed with slate and sandstone, which gave a little gold on breaking. At 270 feet the pug was struck, and to the west of it was 33 feet of lode formation; a drive north was put in on the pug, and at 90 feet in, a horse of mullock was found to split the lode, but at 300 feet the formation consisted of 6 feet to 10 feet of well-mineralized, poor quartz. An intermediate level above the main level was opened from a winze (sunk from No. 5 level), about 120 feet south of the little cross-course; the intermediate level was connected with No. 6 level by a rise, north of which a drive was put in along a lode 10 feet to 12 feet thick, and showing gold on breaking, but several trial crushings yielded only 2 dwt. to 3 dwt. of gold per ton; this poor quartz continued north through the little cross-course to the big cross-course, north of which the country was broken. The ore in the stopes was low-grade, but it improved as it was worked higher; the stopes ranged up to 30 feet wide, and yielded a gradually falling return until the middle of the year 1901, when stoping was suspended.

A drive south on the east side of the pug was started in 1895 on a flat body between 2 ft. and 3 ft. wide, which yielded 3½ dwt. of gold to the ton for about 60 feet. Later, this drive was extended 50 feet on a good payable lode, from 3 ft. to 10 ft. wide, which continued to 190 feet, when the stone became small. In 1898, a south drive also was put in west of the pug; the stopes on both these drives carried fair bodies of ore. At 183 feet south the drive on west side of the pug carried an ore body of fair value, but the quality was not maintained. In 1890, some small flat quartz veins on the Indicator yielded some nuggety gold; during the week ending 10th September, 1900, nuggets weighing 143 oz. were won, but the ensuing operations were unsuccessful. The drive east of the pug was extended to 278 feet south, and the drive west of it to 249 feet south of the cross-cut, but neither face came up to expectations. Towards the end of 1902 a winze was sunk on the Indicator from this level for a depth of 15 feet, and a patch of coarse gold was obtained from a small quartz vein. This vein gave fair ore, but no coarse gold, for the following six months; it was worked by underhand stoping until about May, 1904. The method of working was not advantageous, and when the stone became no longer profitable, work was resumed in the intermediate level north, but nothing payable rewarded a year's prospecting. A rise was put up south of the main cross-cut in 1905, but it failed to intersect any quartz. On the western slates, driving, stoping, and blocking on small irregular veins of variable quality was carried on from 1904.

In 1912, the drive north on the leather-jacket lode, 300 feet west of the shaft, was repaired. At 90 feet north a cross-cut west was connected with the First Chance mine. The main level was driven northerly for 420 feet before bearing north-westerly to the large cross-course at 550 feet. A drive was put in 270 feet along the large cross-course without intersecting any quartz of payable value.

*789-ft. Level (No. 7 Level).*—This level was opened in 1906, and a cross-cut was driven west for 660 feet. At 60 feet from the shaft quartz spurs occur, associated with the anticline, and on these spurs drives north and south were put in. Quartz 20 ft. wide was proved in the south drive, and yields approaching payable were obtained in 1914. A rise was put up 35 feet above the south drive on quartz veins, which were poor.

West dipping strata were passed through to 230 feet, where a syncline occurred, beyond which the beds ranged from 80° east to vertical. At 370 feet a flat slide, at times associated with much quartz and highly mineralized, was cut at 410 feet, the main slide leather-jacket with 1 foot of decomposed dyke rock dipping 45° west, and accompanied by a lode 6 feet wide, was cut and driven on for 110 feet north and 250 feet south.

To a point 500 feet from the shaft the strata, though forming the eastern limb of the anticline, dip 70° to 85° west. Beyond this the beds dip east up to the anticline at 570 feet in the cross-cut. At 590 feet a rise over the cross-cut in west dipping strata connects to the winze workings below the 700-ft. level in the First Chance mine. West dipping strata extend to the face at 660 feet.

The pug or leather-jacket lode in the south drive cut across the strata obliquely for 130 feet. It then turned and followed the strike of the strata, which was here dragged to the west, and carried a more spurry formation. At the bend in the strike a winze was put down to the 889-ft. level. A rise 45 feet south of the winze was put up on the leather-jacket for 45 feet, and a cross-cut east 60 feet from the top of the rise proved payable quartz 20 ft. wide on the western indicator country, which extended up to the leather-jacket, and was stoped 60 feet north and 30 feet south.

At 25 feet north of the rise a cross-cut, the No. 1 east, was put in for a distance of 90 feet passing through quartz 20 ft. wide under the leather-jacket. From the face a rise was put up for 30 feet, and from the top of it a cross-cut east put in, which intersected a make of quartz 30 ft. wide carrying much arsenical pyrites on the Big Slate 15 feet to 35 feet west of the Indicator. Payable values were obtained to a height of 20 feet. The cross-cut was connected north with a rise over the main cross-cut at 300 feet west of the shaft during 1916. Southwards the stopes connected to a rise over the No. 2 cross-cut, which had been driven east from the main drive at 240 feet south of the cross-cut. The No. 2 cross-cut passed through several large bodies of quartz (Fig. 55). At 60 feet east of the main drive a drive south at 90 feet connected with the Llanberris No. 1 workings, and near the south face a cross-cut east (the No. 3) passed through only a few spurs in a length of 100 feet, the face being near the line of the Indicator slates. In the stopes, above the No. 2 cross-cut, an eastern leather-jacket with a felsite dyke (a split) was encountered. (Fig. 55.)

North from the cross-cut at 380 feet from the shaft a drive was started to the east of the leather-jacket on a make of highly mineralized quartz, assays of the mineral from which yielded over 9 oz. of gold to the ton. In the drive the mineral seam gave out, and the drive at 150 feet met the main or western wall of the leather-jacket, which was then driven on to the little cross-course. Clean strata were driven through between the little cross-course and the big one, which was cut at 350 feet north. On the north side of the big cross-course a large quartz spur was cut in west dipping strata. A drive along the cross-course at 30 feet passed through the anticline, which was exposed in the main cross-cut 570 ft. west of the shaft, and beyond which vertical strata occurred up to the leather-jacket at 240 feet from the drive. By driving 50 feet on the leather-jacket, poor quartz was proved, and work ceased in 1916.

On the west side of the anticline a drive north was put in from the big cross-course, and at 180 feet the workings of the Britannia Company on Dunn's lode were holed through to. A rise above this drive connected with the 700-ft. level of the First Chance mine. Some spurs occurring in centre country were tested, but proved no more than payable, and so work in this part of the mine ceased during the latter part of 1916.

*889-ft. (No. 8) Level.*—Work at this level began at the end of 1897. By the end of May, 1899, the west cross-cut had reached a total length of 565 feet, passing through a lode at 530 feet, on which drives were put in north and south; at

130 feet the north drive intersected a slide bearing north-east, on which a strong body of stone occurred showing gold. A winze below this level connected to the stopes above the 985-ft. level. The north drive to 354 feet from the cross-cut carried abundant ore, trial crushings from which were poor. Six months' prospecting failed to locate payable ore in the large formation, but early in 1901 a series of flat ore bodies in the western end of the cross-cut was found to be of good quality, though small. The drive north on the big formation was extended at the end of 1903, but the quartz gave out and nothing payable was found. A drive south was put in 250 feet, and a cross-cut 175 feet west from this point passed through slate and sandstone with quartz veins too small for working. A cross-cut east put in opposite the western cross-cut met with poor quartz; a rise from this cross-cut at 90 feet intersected quartz identical with that being worked at the 828-ft. level in the Llanberris No. 1 mine. South from the top of the rise the make of stone proved to be 60 ft. wide, and a main drive was opened out north, but the stone was found to be poorer, though plentiful. To the southern boundary, 60 feet from the rise, the ore in the level and in the stopes above was payable for 60 ft., the full width of the formation, by the close of 1905.

Stoping on the big lode above the main level gave poor results, and operations were suspended towards the middle of 1905.

*986-ft. (No. 9) Level.*—Cross-cutting west at this level began in 1897, shortly before No. 8 level was opened. At 60 feet from the shaft a body of poor stone 3 ft. wide was passed through. Early in 1898, at 500 feet from the shaft, a strong lode formation was found; it was 24 feet wide with flat veins coming in from the hanging-wall side, and, taken as a body, it averaged 7 dwt. of gold to the ton. A drive was opened north on this lode, and meanwhile the cross-cut was extended west to the western boundary of the lease. The drive north on the lode proved the formation to be 50 ft. wide and payable from wall to wall at 70 feet north, and a drive south proved it to be 20 ft. wide at 170 feet south. Above these drives the lode averaged 7 dwt. of gold to the ton for two stopes in height, and for its full width. The north drive intersected the little cross-course at 272 feet, and proved a strong lode on the north side of it.

No. 2 drive north was put in from the cross-cut on the west side of the lode, which was then taken out 55 feet, the full width between the drives.

Two parallel drives were driven south on the lode, and early in 1899 a large quantity of payable ore was taken out between them, as well as from the stopes above.

The north drive was carried on in the big lode as far as the big cross-course, where a cross-cut was started east to pick up the displaced lode. At 115 feet in the cross-cut a poor and much broken formation was driven on. The stopes over the main level became poorer as risen on, and towards the end of 1899 the average yield fell to 3½ dwt. of gold to the ton, which was just about payable, the width of lode being 50 ft. and the shoot 380 ft. long. Large bodies of low-grade quartz were worked till the close of 1901, when the tributers secured a few better returns from the quartz veins adjoining the main lode. A small vertical lode in the south end yielded fair returns for a couple of years. Early in 1904 the north main drive was extended into the Town Hall reserve on favorable country with quartz veins, but trial crushings proved the stone very poor. A rise above this north drive passed through flat bodies showing galena and blackjack at 84 feet above the drive. A cross-cut from the north drive proved poor flat bodies, and a rise of 60 feet failing to meet with better grade ore, operations ceased in this portion of the mine during 1905.

The south drive was connected to the Llanberris No. 1 workings in 1903, and a cross-cut west was started on the boundary to intersect the lode then being worked by the Llanberris No. 1 Company. When found, this lode proved to consist of 4 ft. wide of vertical quartz and 4 ft. of veins and crushing material on either wall, and trial crushings yielded 6 dwt. of gold to the ton. About 25 feet further west a drive was put in south on another body of quartz, which gave 7 dwt. of gold to the ton where intersected, but the quartz became poor before pitching underfoot, while in the north drive, on the same body, it proved poor after 50 feet. A cross-cut west from the main south drive near the southern boundary intersected a large formation at 120 feet.

*1,085-ft. (No. 10) Level.*—The sinking of the main shaft and the opening out of this level were completed about the middle of 1900. The large formation being worked at the level above led to great expectations for a development in this cross-cut. At 630 feet from the shaft a lode 12 ft. wide was intersected, but it proved to be poor. A south drive on this lode, with cross-cuts at intervals, was put in without success, and a rise was started to intersect the ore body left underfoot in the level above; for 94 feet it passed through clean country, and then it was found that a thin crust of quartz remained below the 986-ft. level. Cross-cuts from the rise failed to locate any ore, but an east cross-cut from a point 100 feet south in the intermediate level (20 feet below the 986-ft. level) proved the lode-formation to be 50 ft. wide and payable, 183 tons yielding 82 oz., an average of 9 dwt. per ton. This ore body pitched fast to the south. The main south drive was then extended, and a rise was put up at 350 feet. For 50 feet the rise passed through clean country, then 45 feet of quartz, which an intermediate level and cross-cuts proved to be poor. From the main or No. 1 rise an intermediate, at 50 feet above the 1,085-ft. level, passed through over 50 feet of quartz carrying only 1 dwt. of gold to the ton. In 1903 stoping and blocking from the rise in the south end proved the lode to carry a strong but very poor formation; this work was continued for a year without better results, but then the ore improved, and payable crushings were obtained from the intermediate levels till 1909, when flat quartz veins were chiefly operated on for about twelve months.

*1,192-ft. (No. 11) Level.*—This level was opened early in 1906, when a cross-cut west was put in. At 70 feet from the shaft quartz spurs in east-dipping strata were met with and driven on.

At 120 feet west an anticline was passed through, and at 225 feet a strong fault in west-dipping beds, carrying numerous mineralized

veins, was met with. Between 270 feet and 280 feet vertical quartz veins in the syncline, and forming on a west-dipping slide, were cut, and drives were put in for 50 feet to the north, and for 130 feet to the south. In the cross-cut three quartz veins yielded 6½ dwt. to the ton in June, 1906, and when opened out north and south the value improved to 7 dwt. The gold values lasted for a length of 150 feet, and extended into the stopes above the level before the end of 1906, when the values fell away.

Clean strata, standing almost vertical, were passed through in the cross-cut to 620 feet from the shaft, when another make of quartz spurs, averaging 8 ft. wide of quartz, was cut and followed at 650 feet by the First Chance anticline. On these spurs drives north and south were opened, and the quartz was proved to be worth 5 dwt. to the ton by a trial crushing. Here drives 10 feet north and 45 feet south were put in before the reef was abandoned as not payable.

At 700 feet west of the shaft the little cross-course was passed through, and west-dipping strata continued up to the face at 755 feet from the shaft. At 620 feet a rise was put up on the reef to a height of 10 feet before work ceased at this level early in 1907. In May, 1908, work was again resumed at this level, but the operations were not successful, and after a short period all the work at this depth ceased in 1909, since when the level has remained under water.

*Gold Yields.*

| Year. | Ore Crushed. | Gold Yield. | | | Remarks. |
|---|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. | |
| 1887 .. | 2,796 | 1,036 | 0 | 18 | |
| 1888 .. | 3,299 | 1,021 | 10 | 0 | |
| 1889 .. | 6,213 | 2,253 | 4 | 0 | |
| 1890 .. | 3,862 | 1,209 | 1 | 0 | |
| 1891 .. | 14,290 | 4,785 | 7 | 0 | |
| 1892 .. | 16,023 | 5,598 | 14 | 0 | |
| 1893 .. | 22,616 | 7,741 | 6 | 6 | |
| 1894 .. | 9,135 | 2,992 | 7 | 12 | |
| 1895 .. | 24,992 | 7,419 | 4 | 15 | |
| 1896 .. | 19,146 | 5,914 | 3 | 18 | |
| 1897 .. | 14,472 | 5,559 | 10 | 12 | |
| 1898 .. | 18,426 | 6,451 | 13 | 9 | |
| 1899 .. | 12,641 | 4,186 | 6 | 0 | |
| 1900 .. | 16,857 | 4,317 | 18 | 0 | |
| 1901 .. | 15,063 | 3,256 | 12 | 0 | |
| 1902 .. | 19,620 | 4,391 | 19 | 0 | |
| 1903 .. | 14,474 | 2,676 | 13 | 0 | |
| 1904 .. | 13,528 | 2,292 | 17 | 0 | |
| 1905 .. | 70,701 | 2,287 | 10 | 0 | 23 feet to ton |
| 1907 .. | 9,441 | 1,953 | 18 | 13 | |
| 1908 .. | 7,353 | 1,815 | 16 | 6 | |
| 1909 .. | 7,052 | 1,890 | 6 | 0 | |
| 1910 .. | 652 | 172 | 10 | 0 | |
| 1911 .. | 945 | 233 | 3 | 0 | Half year |
| 1912 .. | 3,256 | 554 | 12 | 0 | |
| 1913 .. | 432 | 166 | 4 | 0 | Tonnage not complete |
| 1914 .. | 2,938 | 560 | 19 | 0 | |
| 1915 .. | 3,009 | 498 | 1 | 0 | |
| 1916 .. | 2,154 | 508 | 16 | 0 | |

The total value of gold obtained to the end of December, 1916, was £396,809 19s.

| | |
|---|---|
| Wages paid .. .. | £187,458 |
| Contracts .. .. .. | 50,610 |
| Tributers .. .. .. | 39,424 |
| Fuel .. .. .. | 47,122 |
| Dividends paid .. .. | 36,000 |

LLANBERRIS NO. 1 COMPANY.

(Pl. XXI.)

*History.*

The Llanberris No. 1 Company, a tribute from the Llanberris Company, was formed in 1887. It acquired from the parent company the Red Streak shaft, which had been used as far back as 1858, and its chief object at the date of formation was the deeper working of the Indicator line and the Roberts' lode belt of country. In carrying out this scheme, a large formation, associated with a leather-jacket, was intersected at the 630-ft. level in 1892, and the Indicator and Roberts' lodes were neglected. The quantity of stone treated to date is considerable. The bulk of it came from above the 1,128-ft. level. The fact that mining within the area has been almost continuous during the past fifty years serves to indicate the extent of the quartz formations.

*Structure.*

The present accessible workings are, for the most part, in the eastern limb of an anticlinal fold, and little work has been carried out east of the syncline or west of the anticline.



Fig. 59. Anticline, Llanberris No. 1 Mine, No. 7 level, 245 ft. west of shaft. Scale, 40 ft. to 1 in.

The anticline is of importance, as Roberts' lode, which proved so profitable in the Llanberris Company's mine, was located on it.[1] The anticlinal axis has a westerly list; at the 400-ft. (No. 1) level the centre is 90 feet west of the shaft, and at the 1,228-ft. (No. 9) level the centre is 300 feet west. Part of the apparent list is accounted for by the leather-jacket faults, but the true list is indicated by comparing the positions of the anticlinal fold with those of the Indicator at various levels. The "Indicator," which is nearly vertical, is 80 feet east of the shaft at the 728-ft. (No. 4) level, and 60 feet east at the 928-ft. (No. 6) level, the lowest depth at which it can be recognised; below this level the Indicator folds under a syncline. The general dip of the eastern limb of the anticline is vertical, but in some places, away from the influence of the leather-jackets, the dip is slightly to the west.

The synclinal axis has a most marked westerly list, the trough being exposed at 64 feet east of the shaft at the 1,128-ft. level, and at 35 feet east at the 1,228-ft. (No. 9) level. The fold pitches south at 5° at the 1,128-ft. level. West of the Indicator, the Big Slate (the Blocky Slate of the New Normanby) is visible from the 400-ft. (No. 1) level to the syncline at the 1,128-ft. (No. 9) level. The Indicator will reach the syncline at about 1,110 feet.

The chief gold-bearing belt of strata in this mine extends from 90 feet to 220 feet west of the main Indicator; it embraces the Big Sandstone country at the New Normanby mines and the 4-ft. and Duchess Slates of the Victoria

[1] *Ballarat East Goldfield*, by E. Lidgey. Spec. Rept. Mines Dept., p. 8.

United. Three main leather-jacket faults intersect the strata, as shown on section (Fig. 60).

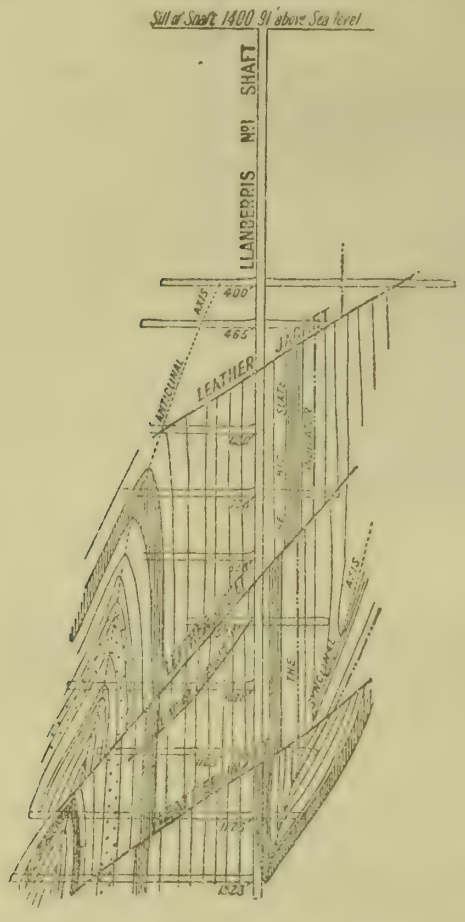



Fig. 60. Transverse Section of the Llanberris No. 1 Mine (looking North). Scale : 300 feet to 1 inch.

Along the course of the leather-jackets much quartz is developed, details of which are given below in the account of the workings. South of the shaft two cross-courses (Nos. 11 and 12 of Lidgey) are traceable throughout the various levels. (Pl. xxi.)

Leather-jacket faults are represented by the main fault, which crosses the shaft at about 520 feet below the surface. At a depth of about 850 feet another leather-jacket was found; drives were extended north and south on this fault at the 1,028-ft. (No. 7) and 1,128-ft. (No. 8) levels at 145 feet and 215 feet west of the shaft respectively. A parallel or footwall break lies 50 feet east of the main break. A third leather-jacket shows in the 1,128-ft. cross-cut at 35 feet east of the shaft and in the 1,328-ft. (No. 10) level at 263 feet west of the shaft. A fourth leather-jacket, together with a large quartz lode, was located at the 1,228-ft. (No. 9) level at 130 feet east of the shaft, but on the south side of the cross-course.

Details of the quartz formations are given in the descriptions of the various levels.

*Details of Workings.*

When the company was formed in 1887, the Red Streak shaft was 400 feet deep, but it had to be enlarged and re-timbered before sinking began. In 1888, cross-cuts east and west were driven at a depth of 482 feet. The western cross-cut intersected Roberts' lode between 70 feet and 90 feet west of the shaft, and a drive was put in northerly at 70 feet to reach a winze at the 400-ft. (No. 1) level. The lode at this level consisted of mixed veins of quartz and lumps of mullock. The east cross-cut was driven 200 feet, where there was a cross-course carrying much water. At 80 feet from the shaft it passed through a make of stone on the leather-jacket which displaced the Indicator, and on which a north drive of 90 feet and a south drive of 190 feet were put in, and let on tribute. The tributers were successful in locating rich stone. The drive north on the leather-jacket cut the Indicator, and was extended to 340 feet, and a rise was put up connecting with the 400-ft. level of the Llanberris Company. The south drive on the Indicator was extended to 291 feet, and a cross-cut was put out east to the Eastern Indicator, where a rise of 30 feet passed through a strong body of heavily-mineralized quartz, showing a little gold.

For the half-year ending August, 1889, 1,119 tons of quartz yielded 949 oz. of gold, as compared with 755 tons for 200 oz. during the preceding six months.

In 1890, the south drive on the Indicator was continued to the boundary, and the eastern cross-cut was extended from 200 feet to 259 feet from the shaft, three vertical makes of stone of no value being intersected.

In the south end of the mine a cross-cut west was driven 100 feet from the Indicator. The drive on Roberts' lode was extended 40 feet north. As these operations failed to locate further payable bodies of stone, the shaft was deepened, and levels were opened at 566 feet and 630 feet early in 1891.

Operations at the 465-ft. (No. 2) level were confined to the Indicator. The veins over the level in the south end of the mine at times carried nuggety gold. At 300 feet north of the cross-cut a rise disclosed several well-mineralized veins carrying gold.

As work on the Indicator progressed, the main slide, or leather-jacket, was found; it pitched north, and cut off the auriferous quartz. In the Eastern Indicator country a drive was put in 126 feet along a make of quartz carrying rough gold before the formation went underfoot; a rise from the level below cut this make. Tribute parties worked veins on the Indicator and Pencil Mark with varying results until the end of 1894. To the west of Roberts' lode country, veins carrying about 4 dwt. of gold per ton were driven on and stoped. At 90 feet from the south main drive, a cross-cut west intersected Roberts' lode, which was here broken and poor, a trial crushing yielding only 3 dwt. of gold per ton. Work in this part of the mine also ceased towards the end of 1894.

*566-ft. (No. 2) Level.*—This level was opened early in 1891, and a cross-cut was driven west. At 41 feet, it intersected a leather-jacket, the main slide, which carried a formation of quartz 34 ft. wide, showing fair gold. The north drive was put in 416 feet without locating payable ore. A cross-cut was driven 97 feet east from the north end of the drive to the boundary of the claim; it passed through the Indicator, but no quartz was found. Early in 1893, the tributers, in rising on the leather-jacket, discovered a strong make of quartz carrying payable gold crossing the Indicator, at a height of about 50 feet; this appears to have been the stone lost underfoot from the level above. This formation was worked on the Indicator for a distance of 200 feet, and was followed east and west, and

when on the Pencil Mark the stone was of good quality.

At 95 feet east of the shaft the cross-cut intersected the Indicator, a rise was put up 80 feet, but it proved only one small quartz vein of poor quality. To the south the stone on the Indicator was poor.

A drive 345 feet long was put in south on the Pencil Mark country, in which payable stone was being worked at the 465-ft. level, but it disclosed no quartz, and a rise of 73 feet cut only a few small veins; these were followed to the Indicator, and a drive was put in along the intersection, with poor results on the whole, though small patches of gold were found.

Operations at this level ceased from 1894 till 1896, after which a tribute party worked for a few months. In 1901 the north level was repaired and driven 60 feet, connecting with the Last Chance mine. Some poor stone was worked by the tributers.

*630-ft. (No. 3) Level.*—The cross-cut west at 630 feet was started in 1892. It passed through several quartz leaders and spurs with a little gold, and at 200 feet a make of quartz 12 ft. wide on the leather-jacket (Roberts' lode?), on which a drive north proved payable stone, and stoping began. At 400 feet north a cross-cut was put out east; this passed through the Indicator and the Eastern Slates. At 191 feet east of the main leather-jacket a parallel fault carrying 2 feet of poor stone was found, and a rise of 14 feet over the back cut another vein 2 ft. wide, which yielded 8 dwt. of gold to the ton on trial, but became poor to the north and south.

The main cross-cut was continued 50 feet, beyond Roberts' lode, but it disclosed only small verticals and strings of valueless quartz.

A drive from the Indicator was put in south from the main cross-cut, in order to intersect some rich veins then being worked from the Llanberris Company's No. 4 shaft, but 350 feet of driving failed to locate any quartz.

Tributers working on the Black Seam to the north opened up a body of quartz in 1895, but the level was abandoned until 1901, when the drive was again worked.

Towards the end of 1894 shaft-sinking was resumed, and at a depth of 728 feet the No. 4 level was opened. Further sinking was then carried out, and No. 5 level was opened at a depth of 828 feet in April, 1895. Between 770 feet and 810 feet in the shaft there were four flat quartz veins, the lower two showing a little gold. These veins dipped east towards the Indicator.

*728-ft. (No. 4) Level.*—A north drive was put in for 92 feet from the shaft, and from the face a cross-cut was driven east for 120 feet without encountering any stone. The level was abandoned from 1896 until 1902, when a cross-cut west was started from the chamber; at 160 feet this cross-cut passed through a fault, which displaced the lode, and here a winze was sunk and connected to the stopes from the level below. At 30 feet down the winze the lode was cut under the fault, and proved to be of good quality. A rise over the level cut the displaced portion of the good vein at 30 feet; this yielded a limited quantity of payable stone, but further rising disclosed irregular veins only. In 1904 a drive on the fault revealed stone showing gold, and a winze was put down from this point to the stopes below for ventilation, &c. Payable veins continued for 160 feet north.

In 1905 work ceased, but in 1906 the western cross-cut was driven to intersect the line of the First Chance lode. A make of quartz was cut and driven on for 80 feet, but proved unpayable. It was further tested at a point 200 feet north of the main cross-cut by means of a cross-cut from the main north drive; and here a formation 6 ft. wide was proved to be valueless.

The main north drive was driven to 250 feet on a full face of poor stone. Operations were suspended in 1907, but in 1908 the north drive was continued to 440 feet on a reef which was payable in some places. It was stoped in the northern end of the level, but pinched out at about 30 feet over the drive. The quartz from the stopes was of average quality, and stoping was continued until 1910, when the ore became poor and the quartz veins small. Stoping ceased in 1911.

A cross-cut, driven east from the north drive at 120 feet from the boundary, passed through some poor quartz veins at 45 feet. At 100 feet east of the main drive the cross-cut intersected a mass of quartz veins 10 ft. wide carrying fair gold, and along which drives were opened north and south. North, at 39 feet, a full face of poor ore showed, and south, at 52 feet, a face of medium-quality ore was exposed. The stope over this drive was in ore which was about payable, but at a height of 15 feet the values ceased, and the stopes were abandoned in 1912.

On the west side of the main drive, at 100 feet from the boundary, a formation of quartz was stoped in 1912, and was about payable.

*828-ft. (No. 5) Level.*—A main drive was put in for 90 feet from the shaft in a northerly direction, and at this point a north-easterly level was driven 105 feet to the Indicator, where a width of 4 ft. of unpayable quartz was found. At 33 feet east of the Indicator the level intersected the Pencil Mark, associated with which there were three well-defined quartz veins showing a little gold. A drive was put in, but these veins also proved unpayable. The cross-cut was continued to 90 feet east of the Indicator without proving any further quartz.

At 155 feet the north drive on the Indicator met with a leather-jacket, which kept in the drive for 90 feet. At 185 feet a rise (No. 2) was put up to test the Indicator over the fault. At 15 feet above the drive a vein showing gold was cut, but a drive proved the quartz to be poor. At 225 feet north, a cross-cut east from the north drive passed through a west-dipping fault at 32 feet, but intersected no quartz in its full length of 68 feet. A rise (No. 1) on the Indicator was put up from the main cross-cut; it intersected a vein carrying rich specimens at 26 feet, but a fault above this cut the quartz off, and the rise was continued to the 728-ft. level without proving any more quartz. A south drive on the vein cut at 26 feet in the rise was put in 30 feet, but the vein was poor, and driving was stopped.

The main west cross-cut was put in from the north drive at 90 feet from the shaft. It cut the Big Slate at 140 feet from the drive.

At 194 feet west of the north drive a body of poor quartz (the western lode) was found early in 1897, and a north drive was opened along it, but little work was done on this until 1902. Drives north and south proved the quartz to be 14 ft. wide, and of a value from 8 dwt. to 1 oz. 6 dwt. of gold per ton. In the north drive and stopes the formation continued strong, and the quartz was taken

out 30 ft. wide in the stopes. At 155 feet in the north drive the lode was 11 ft. wide, and showed good gold. For the next 120 feet the lode widened to over 40 ft. in some places; it consisted of large spurs with a little mullock, and the whole of the quartz was payable. For the next 50 feet the lode was of moderate quality, but in the stopes it maintained a good average value; the gold was sometimes found in veins on one side or the other, or even in the centre of the large formation.

In 1905 the main level north was continued, as the Last Chance Company had proved payable ore near the boundary. The Llanberris No. 1 Company in 1906 began stoping a limited formation of payable quartz, which occurred chiefly as veins. At a height of 60 feet above the drive, and near the boundary, a rise was put up 60 feet, and for the next four years drives and stopes on a make 12 ft. wide and 20 feet high gave fair to payable results for 230 feet from the boundary. Two east cross-cuts were put in from the north drive to trace the continuation of the veins untried in the stopes, and some nice veins were opened over the back of the cross-cut; the stopes extended to a height of 100 feet over the 828-ft. level. At 150 feet north of the cross-cut an intermediate level 50 feet above the north level opened up a large body of payable stone in 1903. The reef in these stopes, which were exhausted in 1906, was up to 30 ft. wide. To trace the continuation of the middle section of the stone worked at this level from the cross-cut for 300 feet north, a winze was sunk at 190 feet north, but at a depth of 20 feet the reef cut out. Underhand stopes were taken out on this body of stone.

A drive south from the shaft cut the cross-course at 87 feet, and a south-west drive along this cross-course passed through 35 feet of vein country after entering the formation at 90 feet from the south drive, and then continued to 310 feet from the cross-cut on poor stone. Two rises—one of 37 feet, and the other of 43 feet—proved that the quartz was poor.

At 280 feet south of the shaft a rise was put up on the Indicator in 1901. In a height of 70 feet this rise passed through several small makes of quartz, which were worked by two parties of tributers for several months.

A cross-cut from the main drive at 300 feet south of the shaft was driven west 218 feet, and at 170 feet the western lode (exposed at 200 feet west of the shaft in the main cross-cut) was cut, but it proved to be poor. A drive along the western lode soon met with a strong well-defined lode showing gold, which continued to the south boundary, a distance of 370 feet. In the stopes over this section the lode was worked up to 20 ft. wide, but as risen on it became narrower. Good payable veins were worked until 1906. In 1903 a winze was sunk below the southern workings, and connected with the intermediate from the 828-ft. level. Good gold was followed in the winze, and fair bodies of ore were stoped.

Little work was done at this level during 1909, but in 1910 a rise was put up on the Western Indicator to a height of 26 feet without proving any quartz. Prospecting in the south drive on the north side of the cross-course gave poor results. A rise was put up at 135 feet south of the cross-cut, and a cross-cut west at a height of 30 feet in the rise intersected a make of poor stone at a distance of 10 feet.

During 1911 operations at the north end of the mine were resumed in consequence of the discovery by the Last Chance Company of payable stone to the east of that previously worked. An east cross-cut 100 feet south of the boundary was cleaned out and extended 40 feet, making its total length 125 feet from the north drive. At 103 feet east a rise on the Western Indicator intersected veins showing gold at 18 feet over the back of the drive; followed west, these veins opened out into a large formation carrying fair gold, the first crushing yielding ½ oz. of gold per ton. This formation was proved payable for a length of 50 feet, and stoping was continued until 1912. The gold died out at 70 feet north of the rise, though the quartz continued. The veins pitched north. An old drive from the cross-cut was repaired for 47 feet, and a cross-cut was driven east 30 feet; a rise at this point intersected the quartz on its north pitch at 10 feet over the cross-cut.

Another cross-cut from the main north drive was cleaned out and extended to 102 feet. This cross-cut was situated 100 feet south of the east cross-cut just described. No. 2 rise was put up at 77 feet from the north drive. It holed through to the south drive from the No. 1 rise at 25 feet over the level, the veins passed through in rising being unpayable. South of No. 2 rise the quartz in the stopes became poorer and smaller, breaking into veins. South and west from the top of No. 2 rise payable veins were worked until early in 1913.

In 1912 the south drive was repaired, and an east cross-cut was opened out for 31 feet at 175 feet from the west cross-cut. This cross-cut passed through two makes of poor quartz 8 ft. and 5 ft. wide respectively.

Shaft-sinking below the 828-ft. level was resumed in April, 1896. At 30 feet below the level a leather-jacket was cut, and 5 feet under this a 6-in. vein showing a little gold. In the next 40 feet there were a number of quartz veins, and at 75 feet a vein 1 ft. thick carrying fair gold. Of the quartz passed through in shaft-sinking, 25 tons yielded 2 dwt. of gold per ton. In two months the sink was completed, and No. 6 level was opened at 928 feet.

*928-ft. (No. 6) Level.*—The cross-cuts east and west at this depth were started in July, 1896. The Indicator was 69 feet east of the shaft. A rise was put up 16 feet on it, but it was found to be much broken, so the cross-cut was continued to the Pencil Mark, on which no quartz was located.

The cross-cut west of the shaft was driven 35 feet without disclosing any quartz. It was then allowed to drain, and when work was resumed a large body of quartz was cut at 106 feet. A north drive of 19 feet sufficed to prove the formation poor, and the cross-cut was then extended to 146 feet. A south drive at 100 feet west of the shaft cut the cross-course at 147 feet. This fault then threw the lode 60 feet to the west. Stoping over this drive began in 1898, and lasted till 1900.

With the object of locating the same formation south of the cross-course, a drive was started from the top of a rise in 1902, and in 1903 a lode 20 ft. wide was found. The main drive on the cross-course was then extended, and the lode was intersected at the level of the drive. A drive was then put in south, but the lode pinched and was poor for 150 feet, and was succeeded by a blank of 80 feet. A rise over the blank proved quartz 5 ft.

wide and nearly payable. The intermediate level on the lode was driven from the top of the rise on quartz showing gold, and a connexion was made to a winze below the 828-ft. level, enabling the southern section to be worked from 1904. The intermediate level was continued to the south boundary. The quartz in the stopes ranged from 4 ft. to 20 ft. wide, and was worked out in 1905, when a lower intermediate level only 30 feet over the main drive was opened near the south boundary on payable stone. In 1906 an old cross-cut was extended 20 feet to the Western lode, which carried payable gold. A drive on this lode to the south boundary proved poor quartz, and a drive was put in north to the stopes. Stoping with indifferent results continued till 1907 in this section. A lode north of the cross-course was prospected in 1908, but it was unpayable.

A drive was put in north from the shaft, and at 40 feet a rise passed through a leather-jacket at 15 feet above the level, and making into a large formation of quartz. A cross-cut 20 feet west of the drive proved that this quartz was 18 ft. wide and 16 feet high for a distance of over 100 feet north, and that it carried 4 dwt. of gold per ton. After six months' work the stone was found to be unpayable, and the country to the west was prospected. Poor quartz 18 ft. wide was passed through, and then a lode averaging 14 dwt. of gold per ton was found. Payable quartz continued to 60 feet in the cross-cut before it dipped underfoot. This formation was cut in the rise over the main drive at 9 feet, proving the body to be 70 ft. wide. The stopes were worked from 1897 to 1902.

The No. 2 west cross-cut, 130 feet north of the shaft, cut this make at 70 feet from the main drive, and a north drive on it carried a solid make of quartz, followed by veins to 223 feet. A large body of ore was stoped over this drive from 1897 to 1903. Further north, the quartz in the drive was poor.

A cross-cut (No. 2), at 180 feet north in the No. 2 north drive, was driven for 100 feet to the Western lode, which was here 6 ft. wide. The lode improved to the south, and became payable. At 60 feet north the lode, 6 ft. wide, was tested for a length of 150 feet, but it proved only moderately good, and an additional 70 feet of driving located only low-grade ore. This part of the mine was abandoned in 1905.

*1,028-ft. (No. 7) Level.*—The shaft was deepened, and the 1,028-ft. level was opened in May, 1899. The cross-cut west was commenced, and passed through several leather-jackets or slides, the first at 39 feet, the second at 81 feet, and the third at 145 feet. The country between the first and second leather-jackets was nearly all quartz of poor quality.

The third leather-jacket carried 1 ft. 6 in. of broken quartz, along which a drive was started to the north. At 97 feet, the fault split into three parts, and the main one was followed. At 157 feet from the cross-cut a rise was put up on the leather-jacket, but, after it had risen 40 feet on a flat dip, a cross-cut east was started, which passed through 50 feet of quartz. At 36 feet east of the main drive, a rise cut the fault at 18 feet over the back. At 40 feet (vertical) in the rise, quartz was found, and the rise was continued to the 930-ft. level. At 45 feet over the back, an intermediate level was opened in a large but poor lode; the north drive for 140 feet was in poor ore, which, however, was stoped to the 930-ft level by contractors. South for 110 feet the lode was poor, but it was stoped to the level above. As this quartz proved so poor, and as there was good ore underfoot at the level above, a rise was put up from the No. 1 cross-cut at 150 feet south of the previous rise, but this holed through without intersecting any payable quartz. Early in 1902 the tributers, after working poor ore for a long time, found payable quartz in a full face, on which they drove north.

At 375 feet north of the cross-cut a large body of quartz was proved, a cross-cut of 20 feet failing to locate the western wall. The stopes over this drive and two intermediate levels were up to 26 feet in width in stone carrying 5 dwt. to 9 dwt. of gold per ton.

At 525 feet from the cross-cut, a drive connected with the workings of the Last Chance mine, there was much quartz, but the gold was found to be in veins along the edge of the lode, which was stoped 20 feet wide for a height of 80 feet, and yielded 6 dwt. to 7 dwt. of gold per ton. The stopes were worked till the end of 1904 for an average return of 7 dwt. of gold per ton, and fair returns were obtained till the end of 1907.

In 1904, after the workings had been connected with the Last Chance mine, a cross-cut was put in west from the main drive in the north end of the mine. It passed through a number of veins, and at 110 feet it intersected the main or Western lode, on which drives north and south opened up a length of 220 feet of payable ore. The lode and adjacent veins were taken out for a width of 50 feet. The veins gave the best returns, but the whole body was of fair value. This formation was worked continuously and profitably until the end of 1906, when the bulk of the payable ore was exhausted. In 1907 a flat make of quartz was opened 40 feet west of the lode and 35 feet up the rise. To the south, this quartz was of good value, but to the north it was poor. It gave fair returns for a year, but then the stone became smaller.

At 280 feet north of the main cross-cut, a cross-cut was put in 30 feet west of the old stopes in 1907, and a large body of quartz was opened up. It gave returns of average value till 1909, when the formations became irregular and payable only in parts.

At 130 feet north of the main cross-cut a winze sunk to a depth of 50 feet passed through nearly payable quartz.

The south drive on the third leather-jacket, started towards the end of 1902, carried a full face of low-grade quartz as far as the cross-course. On the south side of the cross-course payable stone was found, which continued to a break, where the quartz became smaller. A rise of 70 feet failed to disclose anything of value.

In 1909 driving and cross-cutting south of the cross-course opened up ore of little value, and work ceased at the end of that year.

In 1904 a main cross-cut was opened opposite the shaft. At 140 feet it cut the Western lode, which proved to be 2 ft. wide, and poor. A drive was put in for 50 feet north along it.

*1,128-ft. (No. 8) Level.*—In September, 1904, the sinking of the main shaft was continued to 1,156 feet. The No. 8 level was opened at 1,128 feet, and a cross-cut west was started to intersect the lodes worked in the level above. At 180 feet from the shaft the Eastern lode was intersected. It showed gold freely, and was more than payable, but in the drives both north and south the lode became broken and poor.

The main cross-cut was extended west through 14 feet of poor quartz between 220 feet and 235 feet. A drive of 320 feet south on the west side of the lode at 230 feet from the shaft proved veins of fair quality branching off from the main lode, and the stopes over the drive showed irregular formations more than payable in some places and poor in others. Stoping north and south was continued from 1908 until the end of 1910.

The north drive on the Eastern lode at 180 feet from the shaft disclosed poor quartz at 160 feet from the cross-cut. A rise at 140 feet north of the cross-cut connected with the winze sunk from the level above. Two intermediate levels were opened from this rise in 1906, the upper being in ore showing fair gold. The lode up to 12 ft. wide was worked until 1907 with varying results in these stopes, which were connected with the stopes over the main cross-cut.

The north drive on the Eastern lode was continued to 320 feet, where a cross-cut west 105 feet passed through 30 feet of well-mineralized but poor stone, on which a drive was opened north. The main level was continued to the Last Chance boundary, where it broke into a rise belonging to that company. Two intermediate levels were put in south from the rise at the boundary, one at 36 feet up, and the other at 66 feet. The lower intermediate level carried a payable lode, averaging 12 ft. wide for 170 feet. This drive was carried 320 feet on ore of moderate quality. The second intermediate level at 66 feet up was driven 90 feet. A body of ore of fair quality was stoped in these levels from 1906 till the end of 1910 and after. Cross-cuts were put in from the main drive across the lode, but they proved only poor quartz, and two rises met with similar results.

The south drive on the Eastern lode (180 feet from the shaft) intersected the cross-course at 184 feet from the cross-cut. A drive was put in along the cross-course in a south-westerly direction, and at 36 feet a rise connected with the south winze from the No. 7 level. At 50 feet up this rise an intermediate level was opened south, and a large body of poor quartz was stoped. The drive on the cross-course was carried 130 feet before the displaced lode was picked up, and a drive was then started south on a well-defined lode, which showed payable gold in some places. This drive was continued to the south boundary, but the average value of the lode was poor throughout. A rise connected with the intermediate, driven from the rise on the cross-course, also proved poor ore. North from the cross-course rise at 25 feet over the main level a drive was put in 140 feet, and a series of stopes yielded ore of average quality. These drives were abandoned in 1906.

The east cross-cut was put in 90 feet, but it passed through clean country only.

*1,228-ft. Level.*—Towards the end of 1906 the shaft was deepened 100 feet, and 1,228-ft. level was opened. At 90 feet from the shaft the west cross-cut passed through a vertical formation 6 ft. wide, of no value; at 160 feet, an irregular formation, gold-bearing, but unpayable; at 180 feet numerous quartz veins, some carrying fair gold; and at 300 feet what was thought to be the continuation of the Western lode. The quartz veins at 180 feet were driven on north for 25 feet, the stone being nearly payable, and a rise was put up, but the stone tapered out. A rise on the formation, at 300 feet, connected with a winze from the level above, passing through poor veins only. At 23 feet below the 1,130-ft. level, intermediate drives were opened north 42 feet and south 64 feet on full faces of quartz of moderate quality; the stopes above the level proved poor in 1909. At 354 feet the cross-cut was stopped.

The south drive was started at a point 180 feet west of the shaft on quartz 5 ft. wide, showing gold, but unpayable, and was continued to the cross-course at 180 feet. The drive was then turned south-westerly for 200 feet along the cross-course, on the south side of which several quartz veins were cut; these were tested, but proved poor. The south drive on these veins was extended to 200 feet, where a payable vein was stoped for a length of 25 feet in 1916. At 260 feet from the shaft a drive south was commenced on a wide face of quartz carrying a little gold.

A cross-cut east from the shaft was begun towards the end of 1908. At 130 feet a valueless lode, 6 ft. wide and giving off a heavy flow of water, was intersected on the south side of the cross-cut, necessitating the construction of several brick and cement dams in the cross-cut to stop the flow. Within eight hours of shutting the valve the pressure on the dams had risen to over 350 lb. to the square inch. Marsh gas in abundance was liberated from the water.

A drive north from the cross-course, at 100 feet west of the south drive, carried ore of average quality for 50 feet, and stopes over the back proved similar ore. At 70 feet north the quartz became poor, but the drive was continued to 115 feet.

*1,328-ft. Level.*—Towards the close of 1909, the shaft was sunk to a depth of 1,328 feet, at which depth a level was opened. At 254 feet from the shaft the west cross-cut passed through a vein 3 ft. thick, showing fair gold; a fault cut it off, but a drive south for 35 feet showed a fair face of payable quartz, which, however, became small and poor to 54 feet. In the stopes over the level the quartz was of fair size, but poor. The south drive was extended to 106 feet on quartz veins, some of which carried fair gold, the stone averaging 4 dwt. of gold per ton under the fault, on the east side of the drive. From 108 feet to 160 feet south, a vein 1 ft. wide, showing gold, was followed. This vein was not payable, and the stone cut out to the east. The stopes over the drive were unpayable, and the level was abandoned in 1912.

The north drive for 34 feet was along quartz veins, showing fair gold. The formation continued for 110 feet, where a small break threw it over the back of the level, and the drive was continued in slate country; a rise of 20 feet on the break disclosed many quartz veins, all of poor quality. The north drive was extended to 212 feet, but neither it nor the cross-cut west for 113 feet intersected any quartz. A rise of 34 feet on this break carried low-grade ore from 24 feet. From 246 tons of quartz from the drives, stopes, and rise a yield of 30 oz. 6 dwt. of gold was obtained in 1910, but a later crushing proved poorer.

The main cross-cut was extended to 376 feet from the shaft, and but little quartz was found on the line of the western formation of the level above. At 63 feet about 3 ft. of poor quartz veins in slate were cut, and an intermediate level was opened. The rise was connected to a winze from the 1,228-ft. level.

This level was abandoned in 1912 owing to difficulties with water, and has remained flooded ever since.

The following yields were recorded from 1888:—

| Year. | Ore crushed. | Gold yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1888 .. .. | 785 | 200 | 0 | 0 |
| 1889 .. .. | 1,619 | 1,549 | 3 | 10 |
| 1890 .. .. | 2,035 | 860 | 8 | 0 |
| 1891 .. .. | 1,045 | 697 | 17 | 12 |
| 1892 .. .. | 1,483 | 547 | 8 | 0 |
| 1893 .. .. | 559 | 186 | 9 | 4 |
| 1894 .. .. | 2,318 | 826 | 10 | 6 |
| 1895 .. .. | 805 | 146 | 5 | 0 |
| 1896 .. .. | 568 | 93 | 13 | 0 |
| 1897 .. .. | 2,738 | 938 | 8 | 0 |
| 1898 .. .. | 16,498 | 4,243 | 3 | 0 |
| 1899 .. .. | 17,214 | 2,407 | 19 | 0 |
| 1900 .. .. | 12,797 | 2,407 | 19 | 0 |
| 1901 .. .. | 9,293 | 2,796 | 1 | 0 |
| 1902 .. .. | 12,206 | 4,856 | 13 | 0 |
| 1903 .. .. | 15,364 | 6,132 | 9 | 0 |
| 1904 .. .. | 25,367 | 8,847 | 10 | 0 |
| 1905 .. .. | 23,809 | 7,695 | 11 | 0 |
| 1906 .. .. | 22,540 | 6,809 | 4 | 0 |
| 1907 .. .. | 23,593 | 6,253 | 8 | 0 |
| 1908 .. .. | 23,793 | 6,023 | 11 | 0 |
| 1909 .. .. | 24,009 | 5,610 | 19 | 0 |
| 1910 .. .. | 18,904 | 4,167 | 17 | 0 |
| 1911 .. .. | 16,043 | 4,142 | 9 | 0 |
| 1912 .. .. | 18,547 | 4,541 | 0 | 0 |
| 1913 .. .. | 16,393 | 4,234 | 17 | 0 |
| 1914 .. .. | 21,766 | 5,593 | 18 | 0 |
| 1915 .. .. | 14,476 | 4,182 | 13 | 0 |
| 1916 .. .. | 2,494 | 663 | 16 | 0 |

Up to the end of March, 1917, the total output from this mine was 357,955 tons, from which 100,538 oz. 6 dwt. of gold was obtained, and dividends of £44,400 paid. The mine closed down in November, 1917.

### LLANBERRIS NO. 2 COMPANY.

Pl. xxii.

*Historical.*

The Llanberris No. 2 Company was formed in 1903, and acquired the main or No. 1 shaft of the Speedwell Company.

At the date of the formation of the company the main workings comprised a main shaft, 840 feet deep, with several levels opened out. At the 430-ft. level there were cross-cuts east and west, and short drives north and south; at the 500-ft. level there was a cross-cut east, and one west to the Indicator; at the 630-ft. level there was a cross-cut west to the Indicator, on which a drive south extended for 600 feet, at the south end of which there was a cross-cut west to the western country, in which a gold-bearing vein was followed for 100 feet; at the 700-ft. and 770-ft. levels there were cross-cuts to the Indicator, on which drives were put in; at the 840-ft. level there was a cross-cut west to the indicator, on which a south drive extended for 500 feet—a shoot of stone had been worked from the levels above to a point 400 feet south at this level, where it went underfoot, and was tested by two winzes.

On commencing operations in 1903 the main shaft, which was of small size to a depth of 400 feet, was enlarged and re-timbered to water-level, 600 feet from the surface. The shaft was then unwatered, and in 1904 cross-cutting west at the 840-ft. level was commenced. By the end of the year this cross-cut was out 405 feet, and several quartz veins were cut, but on these veins little prospecting was carried out. The Indicator was passed through at 80 feet west of the shaft, and from the west side of the south drive along it gold-bearing quartz was mined. At 135 feet from the shaft a drive was put in 50 feet, and a rise of 18 feet was put up on low-grade stone.

In 1905 the shaft reached a depth of 1,060 feet, a sink of 220 feet being completed, and the 940-ft. and 1,040-ft. levels were opened. The west cross-cut, at the 1,040-ft. level, passed through the Indicator at 78 feet, and was continued to 90 feet. The 940-ft. level west cross-cut met a promising lode formation underlying west at 205 feet, and showing 10 feet of mixed quartz and country rock. At the 840-ft. level the north drive, at 135 feet west of the shaft, was extended, and at 120 feet a formation 10 feet wide, and underlying west, was cut, but proved unpayable at this level. South of the cross-course a drive was put in for 90 feet on the Indicator, besides a rise of 90 feet, but nothing payable was met with.

In 1906, at 278 feet from the shaft, the west cross-cut, at the 1,040-ft. level, passed through a leather-jacket, which was the same as that exposed, at 135 feet west of the shaft, in the north drive at the 940-ft. level. A rise was put up from the 1,040-ft. level on the leather-jacket to a height of 55 feet, passing through several small gold-bearing quartz veins.

At 220 feet from the shaft a drive was put in 50 feet north on some small quartz veins, which were blocked out to the east, giving 55 tons of stone, which yielded 33 oz. 18 dwt. of gold. The main cross-cut was continued to 338 feet from the shaft, and intersected a large formation of low-grade stone, on which drives north and south were started. At the 940-ft. level a drive south on the Indicator was put in 261 feet during the year. At 180 feet south a rise was put up 47 feet, which cut a quartz vein heavily mineralized and carrying fine gold. From this rise a drive was put in south on the quartz vein for 180 feet, the stone on the eastern side showing fair gold. From the south face of the Indicator drive, at 261 feet from the main cross-cut, another cross-cut was put in to explore the eastern country and to command the quartz vein driven on in the rise workings. At 215 feet west of the shaft a drive north at 50 feet from the cross-cut showed 6 feet of quartz in the face. This drive was continued to 140 feet, and then two rises were put up, which proved gold-bearing quartz spurs, from which a trial crushing of 28 tons yielded 10 oz. 6 dwt. of gold. The south drive was put in 94 feet, and from a rise at a height of 50 feet an intermediate level was opened north and south, but nothing payable was located, although an abundance of quartz was proved by stoping. At the 840-ft. level the indicator veins were worked by winzes to a depth of 40 feet, and payable gold was at times obtained in them.

Operations at the mine were suspended during 1907 and 1908, but were resumed in 1909. The shaft was sunk to 1,160 feet, and a level opened west at 1,148 feet from the surface. In 1910 a cross-cut west was put in at the 1,148-ft. level for a distance of 146 feet, passing through the Indicator at 75 feet, showing only small veins of quartz. A cross-cut east at the 1,040-ft. level was put in 123 feet without any favorable development prior to operations ceasing in April, 1910.

*Structure.*

The structure seen in this mine closely resembles that of the Llanberris No. 1 (situated 1,440 feet further north), in so far as relative position of the shaft to the syncline is concerned. The main syncline east of the Indicator is met with in the shaft at a depth of 1,100 feet, but on account of the westerly list of its axis it lies 120 feet east

of the shaft at the 430-ft. level. The First Chance anticline, about 350 feet west of the syncline, is exposed at the 1,040-ft. level at a point 320 feet from the shaft; at the 840-ft. level, 280 feet from the shaft; at the 430-ft. level, brought eastward by the effect of a leather-jacket, 140 feet from the shaft, and at the 310-ft. level at 130 feet from the shaft. A syncline occurs at the 430-ft. and 840-ft. levels at 100 feet west of the anticline. This syncline is not met with in the First Chance section, but is developed in the mines to the south of the Llanberris No. 2, as in the New Normanby (Pl. 25). The eastern limb of the anticline throughout in this mine is remarkable for the uniformity of dip, which varies from 87° west to 87° east, except in the close proximity of the syncline. The western limb of the anticline, and the eastern limb of the syncline, are markedly flat, and vary from 55° to 65° west. The Indicator lies 50 feet east of the shaft at the surface, but owing to the westward displacement of several leather-jackets, it is 70 feet west of the shaft at the 1,040-ft. level, although throughout it is practically vertical. In the shallow levels the Pencil Mark and Black Seam are well shown, but in the deeper levels are not conspicuous.

Faults of the leather-jacket type are represented by four almost parallel breaks; the displacements of these vary from a few feet in the lowest to 150 feet in the uppermost one. The movement in each case is upward on the top side. Cross-courses are also developed, one of which, lying 160 feet north from the shaft and striking north-easterly, has a displacement of only 6 feet, while another 520 feet south of the shaft displaces the Indicator for 100 feet. Both cross-courses are right-hand heaves. The striations on the strata adjacent to the cross-course are horizontal.

*Quartz Occurrence.*

Two types of quartz formations occur in this mine, but the chief work has been confined to the smaller of these on quartz spurs on the Indicator and adjacent slates, while the larger or leather-jacket formations have been little prospected. By rises and winzes the Indicator veins have been worked from level to level to a depth of 940 feet. Cross-cuts west of this line, at the 310, 430, 840, 940, and 1,040 ft. levels all reveal bodies of quartz upwards of 10 ft. in width, on which but little work has been carried on, excepting short drives at the 940-ft. level. This formation was stoped in part, and is identical with that worked for a short distance north in the 840-ft. level at 135 feet west of the shaft, and also at the 1,040-ft. level at 280 feet west.

In the anticline at 310 feet west, at the 1,040-ft. level, numerous quartz spurs occur in slate. These have not been tested. Verticals or laminated bedded veins occur at various places; and consist of quartz, dolomite, and chlorite. They are of no value, being usually met with on the western dip, as seen at 298, 334, 346 feet west of the shaft at the 840-ft. level; and also on the eastern dip at 262 and 132 feet west. Slides or piths occur along the bedding planes, but their influence on the quartz veins was not noticed.

A feature in this mine is the occurrence of black slates to the west of the Indicator, at the 840-ft., 940-ft., and 1,040-ft. levels. These were narrow, from one-eighth to one quarter of an inch wide, and do not appear to be continuous from level to level. No observations as to the influence of these slates at the intersection of quartz veins were possible.

NORMANBY NORTH COMPANY.

(Pl. XXIV.)

*Historical.*

This company, which was formed in 1902, secured the southern portion of the Speedwell Company's claim, including the No. 3 shaft of that company, which had been sunk to a depth of 720 feet. It was, however, unsuccessful in locating payable bodies of quartz. Most of the workings were on a belt near the Indicator and in the neighbourhood of a diagonal fault known as the Angle Slip, the true displacement along which was not known, partly on account of lack of observation and partly on account of difficulties arising from the presence of a syncline, which is 40 feet east of the shaft at the 400-ft. level and 30 feet west at the 1,000-ft. level.

On taking over the claim from the Speedwell Company and unwatering the mine, the Normanby North company began underground operations in November, 1902, at the 700-ft., 600-ft., 535-ft., and 400-ft. levels, and shortly afterwards the 300-ft. level was repaired and connected to the old Sovereign Company's workings. Flat quartz veins were located in each of the levels, and crushings were taken out.

Early in 1903 shaft-sinking began, and a depth of 1,010 feet was reached by June, 290 feet of sinking having taken a period of under seven months. A cross-cut west, commenced at the 1,000-ft. level in July, was driven 220 feet by the end of the year. In 1904 the west cross-cut, at the 1,000-ft. level, was extended to 350 feet from the shaft. Gold-bearing quartz veins were found, and driving and stoping were commenced. At the 700-ft. and 600-ft. levels driving and stoping on veins were continued throughout the year, the chief operations being on the indicator country—between the Western Indicator and the Eastern Indicator. The 900-ft. level was opened, and a north drive was commenced.

In 1905 a 10-head battery was erected. The 1,000-ft. level was extended to 600 feet from the shaft; driving was continued at the 900-ft. level; and a new level, with western cross-cuts, was opened at 800 feet. At the upper levels crushing material was still being won from quartz veins. The shaft was deepened to 1,110 feet, and a cross-cut west was commenced before the end of the year at the 1,100-ft. level.

In 1906 the cross-cut west at the 1,100-ft. level passed through the Indicator country, and a drive was put in northerly along the course of the Angle Slip, at 160 feet from the shaft, to intersect the gold-bearing country being opened on the Indicator at the 1,000-ft. level. At 135 feet from the cross-cut some nice specimens were taken from the Black Seam.

At the 1,000-ft. level underhand stoping of some quartz veins on the Indicator was in progress. Low-grade ore was being opened in the upper levels, the most promising being at the 600-ft. level, where some nuggets were located above the slide. Before the end of the year the general outlook improved. In 1907 operations at the 1,000-ft. level were suspended until near the end of the year, when a drive on the Indicator was put in north after the water had been taken out of the level.

Gold-bearing veins were worked east of the north drive, at the 1,000-ft. level. At the 900-ft.

level driving north was resumed, while the extension west of the cross-cut from the shaft was in progress. At the 700-ft. level several flat makes were worked under the Sovereign Hill, while the testing of veins at the 600-ft. level continued. In 1908 prospecting continued, and extra machinery was installed, including a high-pressure boiler.

At the 1,100-ft. level the north drive was continued to 337 feet north on the Indicator, but though several quartz veins were found, nothing payable was located. A rise connected to the 1,000-ft. level at 320 feet north of the cross-cut. This rise passed through quartz veins at 30 feet over the level, but driving on them gave only fair returns. No change took place in the prospecting operations at the 1,000-ft. level.

At the 900-ft. level large bodies of quartz were met with in the north drive, which was extended to the boundary of the mine, 600 feet north of the shaft. The main formation was poor, but veins to the west yielded profitable returns to the tribute parties. At the 700-ft. and 800-ft. levels plenty of very low-grade ore was disclosed.

In 1909 Wilfley tables and an additional 20-head of stampers were installed to treat the low-grade ore opened at the various levels, and a new winding plant was erected before the end of the year. Above the north drive, at the 1,100-ft. level, the veins worked from the intermediate level did not prove as auriferous as was expected. A south drive, at 113 feet from the shaft, was put in 88 feet, and payable veins were worked to a height of 25 feet.

At the 1,000-ft. level the workings on slates east of the Indicator yielded bodies of poor ore. Tributers at the 900-ft. level had fair returns. At 240 feet west of the shaft the west cross-cut, at the 800-ft. level, intersected a leather-jacket, on which there was a large formation of low-grade quartz, but drives north and south failed to disclose any ore of value.

At the 700-ft. level the south drive, under Sovereign Hill, was continued to 490 feet from the cross-cut, disclosing veins which were stoped. Some veins on the Indicator were worked north of the shaft.

*Structure.*

The feature of geological interest in this mine is a series of indicators, which were recognised by the manager, Mr. T. Tregurtha, who made them a special study. Many of them were only of local importance, and consisted of various slates, which at times contained pyrite seams or other characteristcs, as in the Eastern Indicator, the Mundic Seam, the Ribbon Slate, the Mundic Grit, the Pencil Mark, the Telegraph, the Western Indicator, Greene's Indicator, the 4-ft. Slate, the Western Slates, &c. The quartz veins associated with these at times yielded payable gold, but more attention was paid to working small quartz veins than to prospecting the larger ore-bodies, such as exist on the leather-jackets.

The structure consists of a main syncline and an anticline intersected by leather-jackets, and an older fault known as the Angle Slip. The main anticline is exposed on the summit of the Sovereign Hill; at 360 feet west of the shaft, at the 400-ft. level; and at 480 feet west, at the 1,000-ft. level. At 90 feet east of the anticline there is a roll which causes a repetition of a few beds.

The main syncline lies 40 feet east of the shaft at the 535-ft. level, and 30 feet west at the 1,000-ft. level. Reversal of dip shows at the 600-ft. level west of the shaft where the dip on the eastern limb is 50° west; faulting occurs in this neighbourhood.

Faults of the leather-jacket type occur. One in the shaft above the 400-ft. level can be traced to 300 feet west of the shaft at the 600-ft. level. Another cut in the shaft at the 900-ft. level is identical with the main leather-jacket of the Victoria United, Britannia United, and Last Chance mines to the north; it carries a decomposed felsitic dyke, and is accompanied by large bodies of quartz. At the 900-ft. level a drive was put in 660 feet north along the fault. Payable results were obtained from stopes below the intersection of the leather-jacket and the syncline for a width of 50 feet west of the fault and in places for 20 feet to 30 feet high, but as followed upwards the stone was poor. This fault was worked to the 1,000-ft. level, where, in the north drive, its average dip was 45° west. Flat veins, some of them payable, were cut in rises on the fault. Typical sections of the ore bodies accompanying this fault were exposed in 1909.

The ore bodies associated with the leather-jackets when extensive consisted of much quartz with dolomite, albite, kaolin, pyrite, arsenopyrite, galena, sphalerite, and pyrrhotite. The dolomite occurred in veins up to an inch thick, and often extended beyond the quartz and into the slate and sandstone. In McCarthy's tribute block the reef was above two beds of slate with alternating black layers. In this face the dolomite veins, when traversing the slates, were largely pyritic, and the quartz veins in the sandstone adjacent to the black slate carried crystalline gold.

Another type of fault, and one on which much work has been carried out in this mine, is the Angle Slip, which had a strike of 20° to 25° west of north. This fault is older than the leather-jacket type, by which it is displaced for 80 feet. The amount of movement accompanying the Angle Slip was not easy to estimate.

Near the northern boundary of the claim there is a cross-course, and the combined displacement of the cross-course and leather-jacket about the 400-ft. level caused some confusion. For the same reason the occurrence of a cross-course near the southern boundary of the lease has led to the unwarranted correlation of two distinct indicators

*Details of Workings.*

*300-ft. Level.*—This level, from which much work has been carried out by the former company, was re-opened. In 1903 a rise was put up on the Indicator. In 1904 some quartz veins on the Eastern Indicator were worked as far south as a cross-course. The rise on the Indicator cut a small quartz vein at a height of 30 feet. In 1905 operations east of the shaft were resumed, and a vertical formation was worked. In 1906 some small quartz veins were worked which carried fair gold.

*400-ft. Level.*—The north drive at this level was prospected during 1903, but only poor quartz was found. Another trial was given during 1905, but the results were again poor.

*500-ft. Level.*—During 1905 a body of quartz in a rise yielded 5 dwt. of gold per ton. The vein country at this level was exhausted during the year. In 1906 the western cross-cut was cleaned

out in anticipation of the stone cut at the 600-ft. level proving payable and continuing to this one, and a cross-cut was put in east from the north rise to intersect the quartz which went underfoot at the 400-ft. level. The quartz crushed from this level during the year averaged 4 dwt. of gold per ton.

*535-ft. Level.*—In 1903 several payable quartz veins were worked in the main north drive, but further north they became unpayable. During 1904 the main north drive was continued on quartz veins, which were hardly payable. In 1905 the drive was extended north to connect with the 70-ft. rise from the 600-ft. level. Plenty of poor ore was exposed in the face. Picked quartz from along the drive gave fair crushings. In 1906 several crushings from the eastern Ribbon Slates averaged about 4 dwt. of gold per ton. A cross-cut was put in east from the north rise to cut the stone that went underfoot at the 400-ft. level.

*600-ft. Level.*—During 1903 a cross-cut was driven at this level to meet the old north drive, and a drive north on the Eastern Indicator was in progress. The ore in the south drive was exhausted, and the stopes yielded quartz below the average in gold content. In 1904 the north drive was cleaned out and repaired to the Indicator winze and extended 80 feet. A rise on the Ribbon Slates was repaired, and a cross-cut east from this rise intersected payable quartz. A rise on the Eastern Indicator was up 35 feet, and driving commenced, which later in the year revealed payable quartz in the stopes. During 1905 an opening was made on a small quartz vein at 70 feet in the rise on the Eastern Indicator, where a body of quartz averaging 4 dwt. of gold per ton was intersected.

In 1906 a small prospecting rise was put up on a slide and quartz which produced several nuggets. On top of the slide the 12-ft. and 2-ft. Slates were found with nice flat veins crossing them, two crushings from which averaged over 10 dwt. of gold per ton. To work the veins systematically the main rise was extended 30 feet, and a cross-cut was put out 30 feet. Most of the quartz crushed came from the 70-ft. rise, and averaged 4 dwt. of gold per ton. The stopes were showing a fair amount of ore during the year. In the east country plenty of unpayable ore was in sight.

During 1907 driving and stoping on quartz veins were carried out.

In 1908 the quartz veins were payable in portions of the mine only, but on the whole the values were not consistent.

*700-ft. Level.*—In 1903 the west cross-cut was extended to the lode-track, which had two well defined walls, but only a little quartz between them. Drives were opened out north and south on ore which showed fair gold. During 1904 the north drive off the west cross-cut was driven to 140 feet on quartz 9 in. wide, carrying nice gold. The south drive was in 170 feet on quartz that was widening as driven on. Along the Western Indicator ore of fair quality was stoped overhead and underfoot. A winze sunk from the south drive on a pyritic seam 33 feet west of the Eastern Indicator intersected a make of quartz showing gold. In the intermediate level north the stopes were poor. The make of quartz on the 12-ft. Slate was small, but carried fair gold. The stopes on the Western and Eastern Indicators and the Mundic Seam gave fair returns.

During 1905 the north drive on the 12-ft. Slate exposed 8-dwt. ore. The south drive was cleaned out, and a large body of ore was revealed. The north drive on the Western Indicator veins carried fair gold, but the south end was hardly payable. The south drive on the Eastern Indicator exposed plenty of poor quartz.

In 1906 the west cross-cut opened up payable quartz veins between the 12-ft. Slate and the Western Indicator, and nice gold was seen. In the intermediate level the stopes exposed better ore on the Western Indicator country south of the Angle Slip.

In 1907, a rise at 73 feet south under Sovereign Hill passed through several flat makes of quartz showing gold.

During 1908 the south main rise holed through to the 600-ft. level, and driving and stoping were done with varying results on veins through which it passed. Prospecting from the main rise south, under Sovereign Hill, opened up plenty of low-grade ore. A rise of 90 feet from the north drive west of the shaft failed to intersect payable ore.

During 1909 the south main drive under Sovereign Hill was advanced to a total distance of 490 feet from the cross-cut in a large body of low-grade ore. East of the drive rises were put up 30 feet and 75 feet, and a cross-cut was put out west for 65 feet. The 75-ft. rise was in a mass of quartz veins, in which a little gold was seen in breaking. The intermediate level was driven a total distance of 350 feet north from the west cross-cut; two cross-cuts were opened out west, and two rises were put up. Stoping was carried out in ore which gave fair returns. In the north rise on the Indicator two promising quartz veins were intersected and driven on north.

In 1910 poor veins were worked in the north end of the drive and in the south a large body of low-grade ore.

*800-ft. Level.*—In 1905 the cross-cut west at the 800-ft. level was in 105 feet, where fair quartz went underfoot. During 1908 a main drive was opened out north on the Eastern Slates to intersect the good payable stone worked at the 900-ft. level.

In 1909 the west cross-cut was extended to 240 feet. It intersected a slide associated with a large body of quartz, on which drives were put in 85 feet north and 85 feet south, but the ore proved to be low grade. The north drive on the Eastern Slates was extended to 128 feet. A cross-cut west at this point intersected at 44 feet a formation of quartz 8 ft. wide, showing a little gold and a slide at 56 feet.

During 1910 the west cross-cut was extended to 249 feet, intersecting a reef 5 ft. thick, one crushing from which yielded 6 dwt. 8 gr. of gold per ton, which was payable.

*900-ft. Level.*—During 1903 the main west cross-cut at the 900-ft. level was extended to 30 feet, where it intersected small quartz veins showing gold. In 1904 very little work was done at this level. In 1905 the main north drive was extended to 119 feet in a body of unpayable ore, but in the south drive the quartz veins improved in value. A rise from the Western Indicator country intersected quartz veins carrying gold. During 1906 driving north on the slide revealed payable ore, a continuation of that worked at the 1,000-ft. level.

In 1907 the main north drive was extended to 264 feet, within 336 feet of the north boundary of the mine. The face of the drive was in a mass of payable quartz veins 21 ft. wide, which a rise and stopes proved to be of fair value for a height of 30 feet. A cross-cut was extended 40 feet west from the shaft to intersect formations profitably worked near the company's south boundary by the New Normanby Company.

During 1908 the main north drive was advanced to the north boundary of the mine in strong but unpayable quartz veins nearly all the way. The large makes of payable ore stoped over the level in the early part of the year now became poor, and blocking out on veins west was commenced, and proved payable. The slide in the north end was prospected, and the quartz was found to improve in value.

In 1909 stoping and rising from the main north drive on quartz veins gave fair returns. Large quartz formations opened up on the main slide gave fair returns. During 1910 a big formation of quartz was stoped to 30 feet above the main level, but it became poor. Quartz veins were worked on the west side of the formation.

*1,000-ft. Level.*—During 1903 a chamber was cut at this depth, and a cross-cut was put out west for a distance of 210 feet. At 140 feet the cross-cut intersected the Angle Slip, on which a north drive was put in for 90 feet, where the Western Indicator was found on the south side. A trial crushing from the body of quartz on the Eastern Indicator gave 2 dwt. of gold per ton, and the principal work carried out during the year at this level consisted of driving north and south and rising on this formation. The north drive on the Angle Slip passed through the Black Seam and Pencil Mark, and intersected a fault a few feet from the face, which was 90 feet from the cross-cut.

In 1904 the main west cross-cut passed through a lode-track carrying a little quartz at 480 feet. The quartz in the stopes west of the 4-ft. Slate at 275 feet west of the shaft increased in size northwards, and crushings averaged 10 dwt. of gold per ton. The quartz veins in the south drive on the 4-ft. Slate became larger, but were poor. The north drive on the Angle Slip was driven to the Indicator, along which it was extended to 369 feet. The cross-cut east from the Indicator drive intersected a slide, the Pencil Mark, and also some quartz veins. Payable quartz veins on the slide were worked west across the Indicator. A rise of 50 feet on the slide intersected several makes of quartz, showing gold. The north stope on the Indicator showed two veins of quartz, and a rise was put up. A rise on the Angle Slip disclosed some small and hardly payable veins. Prospecting was carried out on the east body of quartz, which averaged 2 dwt. to 4 dwt. of gold per ton.

During 1905 the west cross-cut was extended to a body of quartz in nice slate country at 600 feet. The north stopes west of the 4-ft. Slates produced fair ore for a time, but eventually became poor. The north drive on the Indicator was continued to 535 feet, the drive following the northerly pitch of the vein. A rise was started on the Indicator to connect with the 500-ft. north level. Quartz veins on the Pencil Mark were stoped on with fair results, and a large body on the eastern side averaged 5 dwt. of gold per ton. A rise was put up 80 feet on the Western Indicator country, where small quartz veins carried nice gold.

In 1906 the winze from the underhand stope in the north drive intersected a 6-in. vein on the Indicator. A stope opened from the west side of the winze yielded quartz which averaged 10 dwt. of gold per ton, and going underfoot south. A strong body of ore carrying visible gold made on the Indicator. The ore went underfoot in well mineralized country. A rise was put up on the slide, and crushings taken from it yielded 8 dwt. to 10 dwt. of gold per ton.

In 1907 east of the main north drive, rising, driving, and stoping on large formations with strong quartz veins going off west for a length of 300 feet gave payable returns. A cross-cut east from the main drive at a point 416 feet north of the shaft was started for the purpose of intersecting the above shoot, and in the face gold-bearing quartz veins were intersected.

During 1908 stoping was carried out east of the main drive for 400 feet on ore of fair quality, leaving a considerable amount of ground to be opened up.

In 1909 the stopes on the Eastern Slates opened up a good supply of payable ore. At 380 feet west from the shaft, the south drive was driven to 90 feet, passing through several makes of low-grade ore. The stopes north continued to supply fair ore, but in some places the large formations broke up into small veins. The quartz on the 7-ft. Slates to the west was poor.

During 1910 a large formation and strong quartz veins were payable on the whole. In the north workings a strong quartz vein on the Indicator, carrying coarse gold, was payable for a length of 75 feet.

*1,100-ft. Level.*—In 1905 the shaft was sunk a further depth, and a cross-cut was opened out at 1,100 feet deep for 30 feet west.

During 1906 the main cross-cut west was extended to 160 feet. At 110 feet west of the shaft it intersected quartz carrying visible gold, and at 150 feet it cut unpayable broken quartz showing fine gold, which, on stoping, became more defined, and averaged 6 dwt. of gold to the ton. The Black Seam intersected this stone. West of the Eastern Indicator, the main cross-cut passed through the Mundic Seam, the Ribbon Slates, the Mundic Grit, and the Black Seam Slates and the Angle Slip at 160 feet. A drive north on the Angle Slip cut the Pencil Mark on the north side, and at 95 feet the Indicator. Driving north on the Indicator and rising revealed irregular quartz veins. At 135 feet the Indicator was better defined. A rise was put up to connect with the 1,000-ft. level, and was extended to 50 feet during the year. Quartz traversed the rise for the whole distance. A drive was opened out north at the top of the rise, where some nice specimens were seen as the drive was extended northwards. The cross-cut passed through three channels of quartz, which, when crushed, yielded 4 dwt. to the ton.

During 1907 the west cross-cut was extended to 158 feet from the shaft, and the north drive was in 164 feet. No other work was done at this level during the year.

In 1908 the main north drive on the Indicator was extended to 337 feet from the cross-cut, passing through several small unpayable quartz veins. A cross-cut was driven east 62 feet to the

Black Seam. At 20 feet south from the north face of the main drive a rise on the Indicator connected with the 1,000-ft. level, and greatly improved the ventilation. At 30 feet above the level drives were put out north and south for a total distance of 140 feet on two veins averaging 5 in. wide, which gave only fair returns. The main slide was found at 51 feet in the rise.

In 1909 the veins on the Indicator worked north in the intermediate level were payable in places, but not so good as was expected. Ore of fair quality was worked west of the Indicator. The south drive 113 feet west of the shaft was driven a total distance of 88 feet, where payable veins were worked for a height of 25 feet. During 1910 poor quartz veins were worked at this level, and also 2 feet of unpayable quartz on the Indicator for about 30 feet.

The following gold yields were recorded from 1902 to 1911:—

| Year. | Ore crushed. | Gold yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1902 (1 quarter) | 553 | 116 | 3 | 0 |
| 1903 .. .. | 4,725 | 1,255 | 17 | 6 |
| 1904 .. .. | 4,202 | 1,532 | 6 | 0 |
| 1905 .. .. | 5,075 | 1,581 | 16 | 0 |
| 1906 .. .. | 5,146 | 1,329 | 1 | 0 |
| 1907 .. .. | 6,653 | 2,240 | 3 | 0 |
| 1908 .. .. | 13,710 | 4,433 | 1 | 0 |
| 1909 .. .. | 13,367 | 4,385 | 14 | 0 |
| 1910 .. .. | 10,151 | 2,159 | 18 | 0 |
| 1911 (1 quarter) | 1,563 | 610 | 18 | 0 |

Gold to the value of £80,354 11s. was won from 65,145 tons of ore treated.

### NEW NORMANBY COMPANY.
### (Pl. XXV.)

The ground held under lease by this company was portion of that purchased from Manners by Messrs. Pearce Brothers in 1879. Prior to becoming the property of Manners, the ground was held by the Queen Victoria Company, whose No. 2 shaft was within the New Normanby claim, and was used by the company as a whim shaft. The chief workings of the previous companies and parties lay above water-level to about 120 feet or 130 feet from the surface.

#### *Structure.*

In the location of the shaft site this company was fortunate, as the structure of the mine reveals.

A series of alternating slates and sandstones have a slight easterly dip and form the eastern limb of an anticline, which is exposed at 125 feet west at the 257-ft. level. The syncline

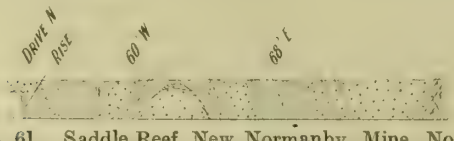



Fig. 61. Saddle Reef, New Normanby Mine, No. 1 Level. Scale, 40 ft. to 1 in.

east of the Indicator is exposed at the 1,389-ft. level at 140 feet east of the shaft. The fold

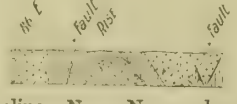



Fig. 62. Syncline, New Normanby Mine, 1389-ft Level, 140 feet east of shaft. Scale, 40 ft. to 1 in.

pitches south, and its axis is inclined to the west. The beds in a western cross-cut at the 1,279-ft. level on the southern boundary are silicified or indurated, and this causes the sandstones to resemble quartzite and the slates to become flinty, but in the deeper cross-cuts to the north the strata are not indurated. The Indicator has been followed by rises, winzes, and drives from the surface to the syncline at the 1,389-ft. level. The parallel slates and sandstones, which at times carry pyrite seams, have received at times a considerable amount of attention, the chief gold-producing portion of the mine being the Big Sandstone and the adjoining slates.

The "leather-jacket" faults or slides are typically developed in this locality, and the shaft is placed so as to intersect these in the vicinity of the more favorable strata. This has led to the location and working of six of the lodes which in places accompany this class of fault (Fig. 63).

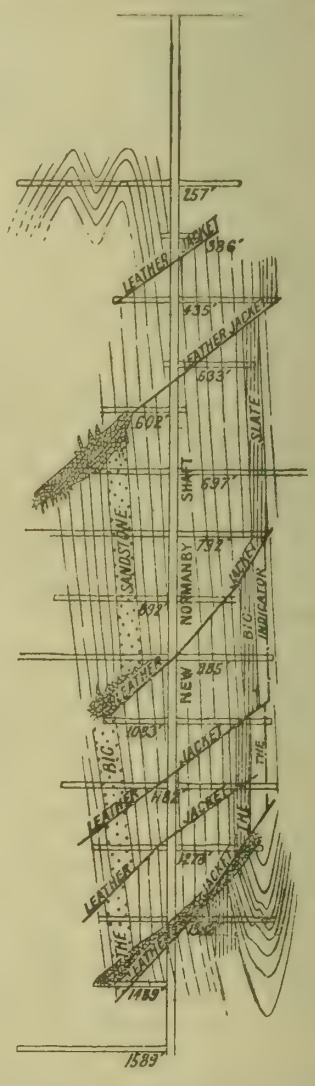



Fig. 63. Transverse Section, New Normanby Mine (looking North). Scale, 300 feet to 1 inch.

The uppermost of these lodes, known as the Queen, passed through the shaft between the 337-ft. and 435-ft. levels, lying 30 feet east at the former and 70 feet west at the latter depth. This lode was better developed to the south of the shaft, and a flat quartz vein, which formed west of the lode, was worked north from the whim-shaft on the Big Slate and across to the 4-ft. Slate. In the deeper levels the bulk of the quartz on the leather-jackets, or slides, has been associated with the western country, but on the Indicator some rich quartz was worked below the 436-ft. and the 698-ft. levels, and it was noticed that the richer stone was south of the

cross-cuts, while to the north it was generally poorer with the exception of the veins above the 793-ft. level, where quartz of fair quality was worked to a cross-course within 50 feet of the northern boundary. At the 1,083-ft. and 1,183-ft. levels good quartz was obtained where a leather-jacket lode crossed the Indicator, the 1,083-ft. level being one of the best levels on the Indicator. The quartz pitched south (see pl. 25), the back of the payable portion conforming to the pitch of the veins for a length of 600 feet. North of the cross-cuts the veins were poor. The Western Indicator, about 90 feet west of the main Indicator, was worked on the Queen lode south at the 436-ft. level in the south part of the mine; below the 892-ft. level some rich quartz was won from the Western Indicator. About 1905, at the 1,083-ft. level south, a patch of nuggety quartz yielding 800 oz. of gold was cut in a rise of 50 feet above a cross-cut from the Indicator drive.

A striking feature in this mine is the enrichment of the gold-bearing veins in the vicinity of a lava or monchiquite dyke, 500 feet south of the shaft. This enrichment takes place not only on the Indicator veins, but on the large quartz blows, and on strata parallel to the Indicator. It was noticed on the Indicator between the 436-ft. and 534-ft. levels. At the 1,083-ft. level good quartz was followed from the cross-cut to the dyke; on the Western Indicator at this level 8 tons of quartz yielded 800 oz. of gold. At the 1,278-ft. level on the New Indicator and south of the dyke, a formation 120 feet wide was worked, but no gold of any consequence was found to the north of it. In the shallow levels on the Queen lode rich ore was won from near the dyke at the 1,279-ft. level.

In the workings on the veins in the neighbourhood of the Big Sandstone slides or piths are found; these slides are younger than the quartz veins, which they fault to the extent of a couple of feet in some instances.

*Details of Working.*

*534-ft. Level.*—This level was opened in 1888, and a cross-cut was driven east to the Indicator, which was cut at 140 feet from the shaft. Gold-bearing veins were found, but they were small in a drive put in south.

*607-ft. Level.*—In sinking the shaft below the 534-ft. level, a body of quartz carrying much water was cut at 570 feet, and proved to be 20 ft. wide. In 1888 the 607-ft., or No. 5, level was opened, and the Indicator, with quartz veins carrying gold, was cut at 140 feet east of the shaft. The drive north on the Indicator to 120 feet carried nice quartz veins with rough gold in places. In the south drive on the Indicator the veins dipped underfoot, and a rise put up to connect with No. 4 level passed through four small veins only.

On the Western Slates, at 50 feet west from the shaft, the cross-cut passed through 20 feet of quartz carrying a little gold, but not payable. A tribute party opened out in a make of quartz west of the Western Slates. The stone proved payable, and a drive south was put in 140 feet in the quartz, which was small.

*698-ft. Level.*—The western cross-cut in 1889 located large bodies of payable quartz at 120 feet west of the shaft; on this drives north and south were put in. Southwards the ore improved in quality, both in the level and the stopes. In 1892 this face was 360 feet from the cross-cut, and during 1893 it was extended to 484 feet in payable quartz of good average quality from 20 ft. to 30 ft.. in width, consisting of large bodies of solid quartz, with many associated quartz veins. By December, 1894, the south face was 570 feet south of the cross-cut, and the level and the stopes were still keeping up a large output of fair quality ore, but in 1895 the shoot narrowed to a length of 100 feet, and was of lower grade. The drive was continued to 607 feet, the reef south of the cross-course in the stopes proving payable, but on the level it was small and poor. The stopes were exhausted in 1896.

The north drive on western lode was driven to 130 feet by December, 1894, in a large body of quartz, which later became broken up and poor. The west cross-cut was put in to 310 feet from the shaft. The Indicator was cut at 150 feet east of the shaft. The cross-cut was continued to 220 feet, and passed through a slide; later a rise was put up on the eastern slates at 190 feet. On the Indicator a rise was put up to the 603-ft. level, and passed through several quartz veins. On the main level a gold-bearing quartz vein was followed on the Indicator, carrying nuggety gold at times. To the north, large formations of quartz carrying rough gold were located and worked in 1893. These extended east and west of the Indicator Slate. In 1895 and 1896 a large body of quartz 50 feet east of the Indicator and north of the cross-cut averaged 6 dwt. to the ton, but it became poor in 1897. Ore of fair quality was won in 1898, and work ceased in 1899.

South on the Indicator some small quartz veins carrying rough gold were followed and risen on, proving more quartz veins of nuggety character in 1894 and 1895, while from the stopes east of the Indicator the quartz yielded 5 dwt. to the ton. At 395 feet south the quartz veins were still payable, and were worked till 1899.

*793-ft. Level.*—This level was opened in 1890, and cross-cuts east and west were put in. The Indicator was cut at 140 feet east on a fault, on which drives were put in and a rise put up. A payable quartz vein was located at the cross-cut, but north at 50 feet and south at 100 feet it became small and poor. In the south drive at 180 feet some large quartz veins dipped underfoot, while a large formation, which was of variable quality during 1894 to 1896, was proved on the west side of the drive.

North on the Indicator at 80 feet from the cross-cut a gold-bearing quartz vein was struck in 1893, and some nuggety gold was obtained from it until the broken country was reached. From the stopes over the drive nice specimens were obtained during 1894 and 1895.

The cross-cut west from the shaft passed through much quartz, and was continued to 224 feet. On the Western Slates, at 180 feet from the shaft, a drive south was put in on some small quartz for 150 feet, where a cross-cut 30 feet west met 3 feet of payable quartz. On this a rise was put up, and large bodies of quartz were located. Quartz averaging 11 dwt. to the ton was obtained from these workings in 1895. In 1898 workings north and west of some former stopes opened up large formations of fair quality stone under the slide, or leather-jacket, and produced crushing material till 1904, when the workings reached the cross-course at 370 feet south of the

cross-cut. South of this the quartz was not located. At 230 feet west of the shaft a drive was put in south in 1893 on a poor make of vertical quartz, which disappeared in clean country after 200 feet of driving.

In 1913 to 1915 a block of payable quartz was taken out under the north drive.

*893-ft. Level.*—In 1890 the shaft was sunk a few feet below the 800-ft. level, but in 1894 a sink of 100 feet was completed, and the 893-ft. level was opened. At this depth a cross-cut was driven east to the Indicator, on which a rise of 54 feet cut a body of quartz containing rough gold, one 20-oz. patch being found. On this an intermediate level was driven north. A fair supply of good ore was kept up from the Indicator for a couple of years, but thereafter it became poor.

On the Mundic Slates a large make of poor stone was worked, but above this the quartz veins from the poor lode were good.

In the intermediate level the veins were worked to a cross-cut at 440 feet south of the main cross-cut, and as the veins dipped, the south drive on the Indicator was extended.

The west cross-cut intersected payable stone at 175 feet, along which drives north and south were put in. A rise in the quartz at the cross-cut proved the lode to be 20 ft. wide.

From a point 350 feet south in the main drive at 175 feet west of the shaft, a cross-cut west was put in to connect with the stopes from the 985-ft. level.

*985-ft. Level.*—Shaft sinking below the 893-ft. level was continued in 1894, and before the close of that year a depth of 1,000 feet was attained, making the shaft the deepest in Ballarat East. Early in 1895 the 985-ft. level was opened. The shaft passed through 30 feet of quartz resting on a fault (leather-jacket) or slide. The plat at the 985-ft. level was cut in a large body of quartz, but no gold was seen in it. The north drive was continued to 302 feet, and the quartz on the fault was stoped until early in 1897, when the stone became unpayable.

A drive on this formation was put in south for 225 feet, but it then became small. At 270 feet south, a west cross-cut intersected, at 50 feet from the south drive, quartz 12 ft. wide yielding 4 dwt. of gold per ton. A south drive was put in on this formation, which soon improved and averaged 15 feet of payable ore up to the cross-course. Some rich quartz spurs were found in the stopes in 1898. This reef formation was followed south to the North Woah Hawp boundary, and was worked by the company for a distance of over 1,000 feet. Near the boundary the stone was small and poor, but a winze 54 feet deep cut several veins carrying fair gold, and an intermediate level at 1,050 feet was opened.

*1,050-ft. Intermediate Level.*—Cross-cuts east and west from the winze were started early in 1895; the east cross-cut reached the Indicator at 157 feet, but a rise at this point disclosed no quartz. At 70 feet east of the Indicator a cross-cut disclosed a formation which was worked in the levels below, but it was here found to be unpayable.

A winze sunk on the Indicator to meet the rise from the 1,083-ft. level cut three large veins. In 1900 a rise over the south drive north of the cross-course intersected a quartz vein, which yielded good patches of nuggets before it pinched and became poor going north. South of the cross-course a large body of poor quartz was cut on the Indicator, and tested for 70 feet in height without any better results, but the veins were payable under this large formation in 1901. North from the cross-cut the Indicator veins at this level were poor. On the Western Indicator some good, though small, quartz was worked in 1903 at 20 feet south of the shaft. This portion of the mine was prospected for several years (till 1905), but the results generally were poor.

*1,083-ft. Level.*—This level was opened in 1896. At 125 feet in the west cross-cut, a large body of poor quartz was located and driven on south, various cross-cuts being put in to test its width. The formation continued large for over 300 feet, but at 400 feet the stone in the face was small. Stoping over the level began in 1897, a length of 200 feet being taken. At 30 feet over the level there was 15 feet of solid quartz, averaging 5 dwt. of gold per ton, with veins of better quality in the wall. At 65 feet over the level the stopes extended to 320 feet from the cross-course or dyke. South of the cross-course the main drive proved a strong body of gold-bearing ore, but driving was slow, as the water was heavy.

The east cross-cut was driven in 1898. At 70 feet it passed through a large gold-bearing formation underlying west, and at 140 feet it intersected the Indicator, on which a rise and drives were put in. In the rise several gold-bearing quartz veins were found. In the north drive on the Indicator small veins were followed for 188 feet. To the south the veins were small for 70 feet, but a large quartz vein came in at that point. In the stope over the level a vein 1 ft. 3 in. wide yielded good patches of nuggets, while two payable quartz veins dipped underfoot. These veins were worked during 1898 and 1899, the south face being then 39 feet from the cross-cut.

During 1900 the veins were followed to the cross-course and blocked out west of the Indicator. Above the level, at 70 feet north of the cross-course, several gold-bearing quartz veins were found and driven on. Payable ore from this part of the mine was obtained throughout 1901.

In 1902 a large formation was intersected on the Western Indicator. This was about 40 feet wide, and of fair quality, showing occasional patches of rough gold. In 1904 the value of the ore fell away as the Indicator was worked north of the cross-cut. In 1905, fair returns were obtained from the Western Indicator. In 1906 some rich yields were obtained on this line north of the cross-course, while south the ore was payable. In 1907 the quality fell away, and continued poor during 1908.

*1,182-ft. Level.*—At 70 feet below the 1,083-ft. level a big lode formation underlying west was cut in the shaft. The 1,182-ft. level was opened in 1900, and the east cross-cut was driven to the Indicator at 136 feet. A rise was put up 60 feet without revealing any quartz, and an intermediate level was opened out to reach the vein that went underfoot in the level above. At 100 feet south, some good patches of nuggets were located, but the quartz vein became small, though it gave good returns during 1902. The intermediate was continued to the cross-course, but the veins were poor for 150 feet from the cross-cut. Payable quartz was found north of the cross-cut.

The west cross-cut at 30 feet from the shaft intersected a large body of quartz, on which a drive was put in for 25 feet south without discovering gold. At 150 feet west another drive was put

in south along a large formation showing gold, which was low-grade for over 200 feet. Stopes over this level were opened in 1901, put proved unpayable, averaging 3 dwt. of gold per ton.

*1,279-ft. Level.*—At 40 feet above this level a body of quartz 20 feet thick was struck in the east side of the shaft. The upper part of this formation yielded nice specimens.

The 1,279-ft. level was opened in 1900. The west cross-cut passed through 30 feet of quartz-bearing country, which was tested by drives north and south. To the south the quartz pinched, and to the north the first crushing was payable, but the lode soon became poor and broken. At 96 feet from the shaft the cross-cut intersected quartz. A drive south on this formation was put in by the adjoining company to drain its mine; part of the drive was in clean country, but at 300 feet south of the main cross-cut a cross-cut proved the formation to be 45 feet in width, and a trial crushing of 50 tons taken from 25 feet of the western portion of the lode yielded 11 dwt. of gold per ton. At 220 feet south of the main cross-cut the formation was 15 ft. wide, and carried gold, and a rise to the level above passed through strong gold-bearing veins. The main drive was continued to the boundary, and proved the stone south of the cross-course to be gold-bearing, averaging from 3 dwt. to 6 dwt. of gold per ton. Stoping from this drive was commenced in 1902, and continued till 1905. Payable stone went underfoot to the south cross-course. Forty feet above the level the lode was 18 ft. wide. On the west side of the lode spurs of good quality were worked. The stone south of the cross-course was worked for a width of 20 ft., but proved of lower value than the northern side.

In 1902, the cross-cut east intersected the Indicator in country, at this point disturbed by a slide. A rise here cut a gold-bearing quartz vein at 54 feet over the level. A drive was put in south on the Indicator, and a small gold-bearing vein was followed, but the country was disturbed, and the vein went underfoot. In 1914, quartz veins east of the Indicator and north of the cross-cut yielded 4 dwt. to the ton.

On the south boundary a cross-cut west from the main drive was put in for 291 feet, passing through several quartz veins, one of which yielded 15 dwt. of gold to the ton.

Between the Western lode and Western Indicator a large spurry formation was opened during 1907. This formation, upwards of 300 feet in length, was payable for a width of from 10 feet to 35 feet, and to a height of over 80 feet. A mineral seam crossing these spurs yielded several nuggetty patches on the north side of the cross-course.

*1,389-ft. Level.*—This level was opened in 1904, a large formation having been found in the shaft. At 140 feet west the main lode was cut and driven on south. For 140 feet payable quartz was mined 15 feet wide. At 270 feet south this stone became smaller, but in the stopes over this level large bodies of quartz were obtained. An intermediate level was driven 50 feet over this drive, and was connected with rises. On this intermediate level the block of stone was worked for a length of over 300 feet and to a width of 50 feet. A large supply of stone from these stopes was maintained during 1906, 1907, and 1908. The east cross-cut was driven to 154 feet without locating the Indicator.

A cross-cut east from the south drive on the Western lode was driven to the Indicator, and a quartz vein carrying fine gold was intersected on this and driven on. A large body of quartz on the Western lode north of the cross-cut gave fair results during 1907, but the stone south of the cross-course on the western line was poor. East of the lode the New Indicator belt of country, which yielded good returns in the level above, was worked; a rise from the south cross-cut proved 20 feet of vein country of fair quality early in 1909, and this proved payable till 1911.

*1,490-ft. Level.*—This level was opened during 1906. At 100 feet from the shaft the cross-cut passed through a lode formation, along which a south drive was extended to the boundary. Between 230 feet and 300 feet from the cross-cut the south drive was in veins pitching south carrying gold, and at 500 feet the country became disturbed. South of the cross-course, at 450 feet south of the cross-cut, the big stone was poor, but veins on the west side carried gold. At 450 feet south of the main cross-cut, a cross-cut east from the drive passed through the New Indicator, the West Indicator, and the Indicator Slates; and a cross-cut west from the same point intersected a body of quartz at 136 feet from the drive. The latter formation yielded 4½ dwt. of gold to the ton, but became poor in the drives extended along it; it was then abandoned till 1914, when payable crushings were again obtained. The west cross-cut from the south drive was continued to 181 feet, and a rise of 44 feet on the quartz passed through reached the intermediate level. Stoping over the main south drive began in 1907 on payable ore, and the veins west to over 40 feet from the lode were richest.

In 1911 the stopes north of the cross-course were 500 feet in length and 20 feet wide.

In 1912 the stopes were 600 feet long, the big lode being poor, while the flat veins were about payable; in the south end quartz veins only were being worked for a width of 45 ft. from the boundary. Stoping in this formation was in progress in 1915 from the intermediate level 50 feet over the main drive, the face of which was now 200 feet north of the main cross-cut. The lode was 12 ft. wide, and flat veins extended 50 feet to the west of it.

*1,590-ft. Level.*—The crosscut was opened towards the end of 1913, and was driven westerly along a cross-course which was intersected in the shaft. At 220 feet south-west of the shaft a lode track was found. At 60 feet south a payable shoot, 40 feet long, was intersected.

In 1913 an intermediate level 50 feet above the main drive yielded fair ore, as did also the stope above; the higher stopes were in smaller quartz of low value. In 1914 the intermediate level was extended to 125 feet north of the cross-cut, the lode being taken out for 50 ft. wide in payable quartz (vein formation). At this point a cross-course was struck, which gave out much water, and no work was done to prove the formation to the north of it. Stopes south of the cross-cut yielded quartz worth from 4 dwt. to 5 dwt. to the ton for 30 ft. wide, These stopes were exhausted in 1915.

In 1916 a block of quartz under the intermediate level and north of the cross-cut proved payable, and was taken out. The western lode proved to be poor during the year.

The lode track was followed, a few colours of gold being met with at 320 feet south, but values to the face on the south boundary over 600 feet south of the cross-cut were low.

Several rises were put up and an intermediate level was opened at 65 feet above the main drive, proving small bodies of quartz. As stoping was opened up some large bodies of quartz were revealed, and west of the main south drive a large lode was located, which proved to be worth from 3 dwt. to 4 dwt. to the ton. The ground at this level was heavy and required much timber. Stopes up to 50 ft. wide were worked over the south drive, but were barely payable, owing to high cost of mining and increased quantity of water at this depth. The western lode and hanging wall portion were of better grade (5 dwt. to the ton), and were worked for a length of 230 feet, averaging 12 ft. wide. A winze was put down 8 feet in stone of the same value before work ceased. North of the cross-cut a large gold bearing formation was followed to the cross-course at 85 feet. From this formation 241 tons yielded 62 oz. 15 dwt. of gold; pyrites worth up to 5 oz. to the ton was present in the stone to the east, which averaged 3 dwt. to the ton. Work ceased at the mine early in 1917.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1887 .. .. | 277 | 117 | 7 | 12 |
| 1888 .. .. | 1,459 | 673 | 16 | 18 |
| 1889 .. .. | .. | | | |
| 1890 .. .. | 4,874 | 233 | 12 | 6 |
| 1891 .. .. | 7,550 | 2,681 | 5 | 0 |
| 1892 .. .. | 9,161 | 3,534 | 17 | 6 |
| 1893 .. .. | 11,840 | 6,136 | 12 | 18 |
| 1894 .. .. | 15,368 | 5,472 | 5 | 16 |
| 1895 .. .. | 12,778 | 4,553 | 11 | 18 |
| 1896 .. .. | 11,198 | 3,110 | 17 | 12 |
| 1897 .. .. | 7,881 | 2,580 | 18 | 12 |
| 1898 .. .. | 19,330 | 6,595 | 17 | 0 |
| 1899 .. .. | 16,944 | 6,180 | 7 | 14 |
| 1900 .. .. | 14,722 | 5,439 | 4 | 0 |
| 1901 .. .. | 9,772 | 2.977 | 7 | 12 |
| 1902 .. .. | 9,781 | 3,704 | 18 | 12 |
| 1903 .. .. | 15,364 | 6,132 | 9 | 0 |
| 1904 .. .. | 15,473 | 4,771 | 3 | 0 |
| 1905 .. .. | 20,474 | 5,653 | 8 | 0 |
| 1906 .. .. | 27,705 | 6,795 | 2 | 0 |
| 1907 .. .. | 27,528 | 5,718 | 17 | 18 |
| 1908 .. .. | 30,522 | 7,652 | 5 | 18 |
| 1909 .. .. | 30,239 | 7,689 | 15 | 0 |
| 1910 .. .. | 28,674 | 6,377 | 12 | 12 |
| 1911 .. .. | 22,794 | 4,871 | 16 | 12 |
| 1912 .. .. | 16,016 | 3,384 | 8 | 0 |
| 1913 .. .. | 10,831 | 2,616 | 12 | 0 |
| 1914 .. .. | 18,038 | 4,998 | 2 | 0 |
| 1915 .. .. | 19,906 | 4,063 | 17 | 0 |
| 1916 .. .. | 13,213 | 2,442 | 6 | 0 |

Gold valued at £531,570 9s. was won from 1887 to 1916, and dividends amounting to £37,200 were paid.

### NORTH WOAH HAWP MINE.

(Pl. XXVI.)

#### *History.*

The North Woah Hawp Company, which was formed early in 1883, secured the southern portion of the lease held by Messrs. Pearce Brothers, on which the No. 2 shaft of the defunct Queen Victoria Company was situated. Prior to the purchase by Pearce Brothers, in 1879, the area was worked by Manners from 1875 to 1878; Manners obtained the lease from the Queen Victoria Company, who held the ground from 1868 to 1874. At an earlier date the Canadian, the Old Canadian, and the South Canadian Companies worked portion of the area (see pp. 129, 142 & 157).

On entering into possession in 1879, Pearce Brothers sank a new shaft (the present main shaft of the North Woah Hawp Company), and on opening out at a depth of 350 feet they drained a water-logged area, which extended from Sovereign Hill to the Prince Regent, the water-level being within 160 feet of the surface. One of the concessions in the lease allowed the owners of the small claims to work to a depth of 260 feet, and after the water was drained many co-operative parties began to work, with the result that Ah Tuck, Tinworth, and Clarke opened up payable mines, and these led to the formation of the Woah Hawp Canton Company, and shortly afterwards to the flotation by Pearce Brothers of their area into the North Woah Hawp and the New Normanby Companies. The North Woah Hawp Company utilized several of 'the small parties' shafts, forming these into their Nos. 2, 3, and 4 shafts, which were deepened and connected by levels and stopes with the main shaft. Within the present lease is the abandoned shaft of the North Prince Extended Company; this shaft, 600 feet in depth, was sunk to test the Sulieman line of lode (see p. 161).

The mine is the most southerly of the group of Ballarat East mines where systematic and continuous operations on the indicator belt have been carried out. No evidence is available to support the view that either the formations or the gold contents should extend no further south; this mine appears to mark the southern limit of successful mining on account of want of prospecting at comparatively shallow levels further south. Of the mines in that direction, the South Woah Hawp, Dalzell-cum-Prince-Regent, Clarke's, and the Prince Regent prospected only limited areas.

#### *Structure.*

The North Woah Hawp mine possesses features typical of the mine adjoining on the north (the New Normanby), to which it is connected at various levels. A series of alternating slates and sandstones forms the eastern limb of an anticline that lies to the west of the shaft. The syncline is visible to the east of the mine under review in the workings of the Woah Hawp Canton (see p. 245). The beds throughout the mine are nearly vertical, with occasionally a slight eastern dip. Over-folded strata are rare, and exist only in close proximity to the leather-jackets, slides, or quartz spurs. A minor fold or crumple shows on the eastern side of the shaft down to the 948-ft. level, where it dies out in the east-dipping beds.

The various strata exposed in the cross-cuts are continuous to the greatest depth attained. Several of the more favorable beds have received local names, among the typical being:—

The Streaky Slate, 8 feet east of the Indicator.
The Indicator.
The Telegraph, 7 feet west of the Indicator.
The Blocky Slate, 20-40 feet west of the Indicator.
The Western Indicator, 90 feet west of the Indicator.
The Mundic Grit in the 6-ft. Slate, 111 feet west of the Indicator.
The Greasy Head Country, 117 feet west of the Indicator.

The Flucan in the 12-ft. Slate, 160 feet west of the Indicator.

The 18-in. Sandstone, 172 feet west of the Indicator.

The 2-ft. Slate, 174 feet west of the Indicator.

The Big Sandstone, with several 6-in. and one 1-in. Slates, with 200-230 feet west of the Indicator.

The 4-ft. Slatee, 236 feet west of the Indicator.

The 7-ft. Slates, 270 feet west of the Indicator.

With slight variation due to faulting, &c., these average distances are maintained throughout the mine.

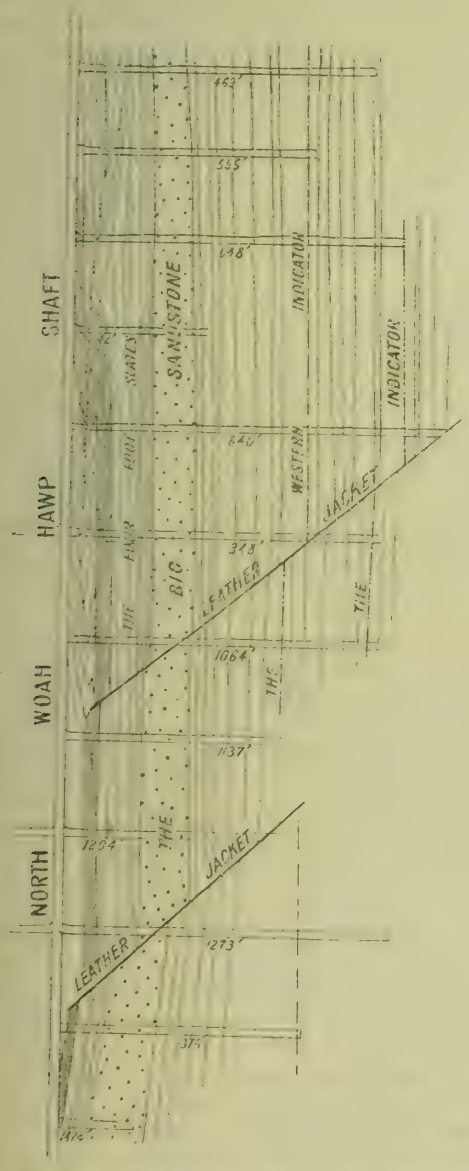



Fig. 64. Transverse Section, North Woah Hawp Mine (looking north). Scale, 200 feet to 1 inch.

Two well-defined leather-jacket faults (slides), with the usual accompanying blows of quartz, occur, the uppermost reaching from the 840-ft. to the 1,204-ft. level before reaching the west-dipping strata. The lower fault was worked from the 1,204-ft. to the 1,375-ft. level, but, though a large lode continues to and below this level, the formation was erratic in gold values. In the northern end of the mine another and still lower fault is being worked from the New Normanby mine, but the continuation is not visible in either the 1,375-ft. or the 1,474-ft. cross-cut opposite the shaft.

The mine has been remarkable for the nuggety gold won from the various slates. About 1896 one vein on the Western Indicator, at the 1,064-ft. level, yielded 1,100 oz. of amalgam from 11 tons of quartz. This rich patch was found at about 280 feet south of the main cross-cut, in the vicinity of several breaks.

*Details of Workings.*

From the inception, in 1883, until 1887, the record of work in shallow levels is not available. Operations were continued at Nos. 1 and 2 levels in 1887, a second shaft being sunk over the stopes above the No. 1 level for the purpose of ventilation, as well as for the haulage of ore and supply of timber. Prior to this the air in the stopes was bad. The tribute parties on and about No. 1 level provided the bulk of the quartz during the earlier part of the year, but when a connecting winze was sunk from No. 1 to No. 3 level, rich veins on the Indicator were made available for stoping. At the No. 3 (468-ft.) level rich quartz was mined on the Indicator.

By June, 1888, the No. 4 (555-ft.) level was opened, and a western cross-cut was put out to intersect some quartz passed through in the shaft. The stopes at the No. 1 level were poor throughout 1888, but the No. 3 level, north and south of the cross-cut, and the stopes above, supplied ore of good value, the average return for the year being over 9 dwt. of gold to the ton.

In 1889 the Nos. 3 and 4 levels were connected by a winze. Ore of good quality was found at No. 4 level north and south of the cross-cut, though the veins were small and the country hard. The main drive, at the No. 3 level, was extended to the north and south boundaries of the claim, and various blocks were let on tribute. At this time prospecting operations were being carried out at the No. 2 shaft at a depth of 300 feet without result. In the No. 3 shaft tributers were working the Western lode, which yielded 6 dwt. to 8 dwt. of gold to the ton at times. The No. 4 shaft was sunk to a depth of 400 feet, and proved a large body of payable quartz. In 1890 the returns from the indicator workings, at the No. 4 level, fell away. A drive south, 800 feet in length, cut various formations, but the results were poor. The No. 2 level was connected with the No. 4 shaft, and 10 dwt. stone was opened up. Throughout the year the tributers' blocks were poor. The No. 3 level operations were chiefly on slates west of the Indicator, where ore of fair average value was found.

Early in 1891 the sinking of the main shaft was resumed, but at 40 feet below the No. 4 level, a body of quartz containing much water was struck. A larger winding engine was installed to deal with this water, and sinking was completed, the No. 5 plat being cut by the end of the year. The shaft passed through several quartz spurs.

At the No. 4 shaft the south drive on the Indicator was connected to the Woah Hawp Canton, and large bodies of payable ore were opened up in the stopes. The drive in the Western lode at the No. 4 level proved poor ore during the first part of the year, but the values improved before its close. The stopes at the No. 2 level yielded a large supply of good ore.

In 1892 the cross-cut east at the No. 5 (648 ft.) level was extended to the Indicator, a distance of 341 feet, but the quartz veins intersected by driving 260 feet south along the Indicator were not payable, and a rise of 100 feet to the No. 4

level failed to prove any ore of value. At the No. 4 level the quartz on and to the east of the Indicator gave fair results. The Western reef at the southern end of the mine opened up well. At the Nos. 2 and 3 levels large bodies of fair grade ore were being worked. At the No. 3 shaft prospecting was carried on without result, while in the No. 4 shaft the quartz maintained a good average value.

In 1893 the south drive at the No. 5 level was extended to within 400 feet of the south boundary, and a rise was put up to intersect the continuation of the lode worked by the adjoining company, but nothing payable was found. At the No. 4 level the drive on the Western slates was extended to 870 feet south of the cross-cut, plenty of ore being in sight. The Indicator workings at this level also gave good returns. At the No. 3 level driving north was in progress, while the stopes over the south end yielded ore of fair quality. At the No. 2 level the tributers were on quartz of indifferent value. The No. 4 shaft was deepened during the year.

During 1894 the south drive at the No. 5 level was extended to near the boundary, proving large bodies of poor quartz. At the No. 4 level the drive north reached the boundary, and a rise connected to the New Normanby mine, where a large body of payable ore was being worked. In the eastern workings payable ore was also being won. South of the cross-cut the ore was of fair quality. At the No. 2 level the Indicator, and at the No. 1 level the Mundic Slate country were being worked. The workings from the No. 3 shaft were also in this run of country. At the No. 4 shaft the Western lode was poor. For the year 11,478 tons of ore yielded 4,166 oz. 4 dwt. of gold.

In 1895 the south drive at the No. 5 level reached the boundary, and stoping over the level was commenced near the face; the reef averaged 5 dwt. of gold to the ton. Rising on the Indicator to intersect veins which pitched underfoot from the No. 4 level was in progress. Drives north and south on the Indicator located nothing of value. At the No. 4 shaft the Western lode in the south stopes was irregular in value.

The workings on the Indicator were payable. At the No. 3 level north, payable stone was cut and stoped. At the No. 2 level south, a rise was put up, the slide was cut, and a drive put in on payable ore. At the No. 2 level tributers were at work on small veins, while in the No. 1 level a payable formation was found at 200 feet north of the cross-cut. Towards the end of the year the shaft was sunk an additional 50 feet.

In 1896 the 743-ft. (No. 6) level was opened and the cross-cut east was extended to 140 feet passing through a large unpayable formation. A drive south on the 4-ft. Slate was extended for over 400 feet without meeting payable quartz. At the No. 5 level several nuggets were located on the Indicator. A rise on the south boundary connected to the North Prince Regent workings. The supplies of ore at the Nos. 3 and 4 levels were exhausted, and the Nos. 1 and 2 levels were abandoned.

Throughout 1897 the stopes in the south end of the No. 6 level yielded larger bodies of patchy ore from the lode, which was 30 feet wide. A connexion to No. 5 level secured good ventilation. At 50 feet east of this lode was a make of quartz 15 feet wide, and at 110 feet the Western Indicator, where a large mineralized formation was located. At the No. 5 level operations were confined to the south stope. The Eastern and Western Slates at the No. 4 level were worked for part of the year, the result being fair. Operations at the No. 3 level ceased.

In 1898 the shaft was sunk to 1,050 feet, passing through several formations of quartz, the water from which was troublesome. The 840-ft. level was opened east, and at 200 feet from the shaft, and a body of payable ore was found and driven on. The 948-ft. level, which was also opened during the year, intersected a lode 6 ft. wide at 138 feet east of the shaft. The stopes at the 743-ft. level continued to supply good ore.

In 1899 the shaft was sunk to 1,080 feet, and then sinking was abandoned on account of a large flow of water from a formation of quartz. The 948-ft. level cross-cut reached the Indicator at 325 feet from the shaft, after passing through a poor formation 40 ft. wide. The Western lode opened up well; in the stopes the ore was payable for a width of 50 ft. and a length of 130 feet. The 840-ft. cross-cut was extended to 260 feet, and the Western lode was followed for over 500 feet, but it then became small. The south drive at the 724-ft. level was advanced to 956 feet in a poor formation, but good stone was being worked in the stopes, where the lode was small.

In 1900, the western workings at the 948-ft. level proved a large body of payable quartz. The drives on the Indicator were unsuccessful in locating anything of value. The 840-ft. level east cross-cut was extended to 400 feet, and passed through a lode 30-ft. wide consisting of solid quartz and veins of a promising character. The drives on the Western lode north and south proved payable ore for a length of 500 feet. The drive south on the Indicator occasionally yielded nuggety gold.

During 1901, the north drive on the Indicator at the 948-ft. level met with only poor ore, but veins in the stopes above the drive were profitable, though patchy. The stopes on the Western lode were large and payable. At the 840-ft. level the drive on the Western Indicator carried veins of quartz which showed coarse gold occasionally, but were poor on the average. The 743-ft. level was worked on tribute, fair results being obtained from small veins. At the 468-ft. level, some quartz veins east of the Indicator gave good results for a time. The net results compared favorably with those of the preceding year. 15,554 tons crushed for 5,621 oz. of gold in 1900, compared with 14,954 tons crushed for 6,157 oz. during 1901.

In 1902, the Indicator at the 948-ft. level yielded payable, though patchy, ore. On the Western lode, the stopes connected with the New Normanby Company's workings, where a large payable formation was being stoped. The southern stopes on this line were chiefly on payable veins. Cross-cuts west of the Western lode, and east of the Indicator, failed to open up any payable ore. At the 840-ft. level, work on the Indicator met with little success. The operations in the 743-ft., 555-ft., and 468-ft. levels were confined to small quartz veins of patchy value. For the year, 10,919 tons of ore yielded 6,015 oz. of gold.

In 1903, shaft sinking was resumed for another 220 feet, and plats were cut at 1,064-ft. and 1,137-ft. levels. A formation which was cut in the shaft at 1,080 feet continued in the shaft to the 1,137-ft. level; it showed fair gold at times,

and yielded from 2 dwt. to 5 dwt. of gold to the ton. At the 1,137-ft. level, a drive was put in north for 125 feet along this formation, which proved to be payable. The south drive proved flat quartz veins. The east cross-cut reached the footwall or slide at 50 feet east of the shaft.

Operations at a depth of 1,204 feet were conducted from the New Normanby mine, a cross-cut on the boundary meeting several payable quartz veins. The 1,064-ft. cross-cut was driven to the Indicator at 320 feet east of the shaft, and a rise to the level above passed through several veins.

In the main cross-cut, two quartz veins carrying payable gold were found within 200 feet of the shaft; drives were put in north and south on small veins in the 4-ft. Slate. The Flucan and the Western lodes were also worked at this level.

At the 948-ft. level, the Western lode was stoped, a large formation being mined in the north end, and flat auriferous quartz veins in the southern workings. Payable quartz veins were found on the Western Indicator. The north drive on the Indicator connected with the New Normanby mine, and opened some good veins. Many nuggets were obtained from a drive on the slide intersecting the Indicator.

Work at the 840-ft. level was confined to payable quartz veins in the Western Indicator country. At the 743-ft. level, the stopes in the south end of the workings continued to yield well, while prospecting east of the Indicator at the 648-ft. level revealed several small low-grade veins. Small quartz veins were still being worked at the 555-ft. and 468-ft. levels, but the results varied considerably. The amount of ore crushed during the second half of the year was double that put through during the first half. The total for the year was 14,476 tons crushed for 7,448 oz. of gold.

During 1904, a greatly increased output was secured from large bodies of ore at several levels, and though the average values were lower, the profit was satisfactory. At the 1,137-ft. level, the lode went underfoot at 200 feet north, but good values were obtained from a winze. The main cross-cut at the 1,137-ft. level was extended to the Indicator, several quartz veins being intersected. The main north drive on the 4-ft. Slate was carried to 220 feet in ore of fair quality; while the stopes above yielded a large quantity of ore of average value. To the south, the drive followed a large flat vein of fair quality for 170 feet.

At the 1,064-ft. level, a rise on the Indicator connected to the level above, and an intermediate level driven to intersect the vein worked below the 948-ft. level failed to locate any payable ore during the year. On the Western lode, several makes of stone were worked, the north drive proving a lode 20 ft. wide at 260 feet from the cross-cut. The stopes on this lode were in quartz of irregular value. At the 948-ft. level, the spurs on the Western lode carried large bodies of payable quartz in the north drive, while veins continued in the south drive. Prospecting operations on the Western Indicator located a payable flat formation. The results from the 840-ft., 743-ft., and 468-ft. levels were mostly poor, and the workings on the Eastern line at 468-ft. level, after connecting with a whim shaft for ventilation, &c., were abandoned. From the New Normanby mine, the Western lode was stoped from the boundary cross-cut with good results. The year's output was 8,062 oz. of gold from 24,449 tons of ore.



In 1905, the output was still larger, 28,219 tons yielding 8,557 oz. of gold, but the Western lode at the 1,137-ft. and 1,064-ft. levels only averaged 3 dwt. of gold per ton. The shaft was sunk a few feet during the year. At the 1,137-ft. level, at 150 feet north of the main cross-cut, a parallel north drive was put in from a cross-cut 23 feet in length. Stoping between the two north drives was carried on to 270 feet north of the shaft. The south drive on the 4-ft. Slate was extended to 306 feet on flat quartz veins of average value. The tributers in the upper levels worked chiefly on the Western Indicator with varying results.

In 1906, shaft-sinking was completed, and the 1,204-ft. level was opened, from which cross-cuts were extended west 54 feet and east 143 feet. A drive south was put in for 37 feet on a formation which had been intersected by the west cross-cut, but the quartz became small at the end of the drive. In the east cross-cut, at 140 feet from the shaft, drives were put in north and south on a small vein which carried gold.

At the 1,137-ft. level the stopes on the Western lode continued payable. The ore in the south drive on the Western Indicator improved, but became poor in the north drive. The Western lode was worked at the 984-ft. and 1,064-ft. levels, chiefly on small quartz veins, which gave good returns.

During 1907 operations were confined to the deep levels, and a new level was opened at 1,273 feet, from which a west cross-cut was put in 60 feet, where a small body of quartz carrying a little gold was driven on north. The east cross-cut was driven only 20 feet by the end of the year. At the 1,204-ft. level the main north drive was extended to 500 feet, and stoping above the level yielded large bodies of payable ore for the last 200 feet. Other lines of slates were being proved by drives, and large quantities of ore averaging over 5 dwt. of gold per ton were opened up. At the 1,137-ft. level the western stopes yielded average results. The north drive off the east cross-cut was patchy, while south the stopes on the Western Indicator gave variable results, a few rich patches being found early in the year, but the general results were poor. The stopes from the intermediate above the 1,064-ft. level gave fair returns, but the quartz veins were small. For the year 19,868 tons were crushed for a yield of 2,589 oz.

A new winding plant was erected early in 1908, the water in the lower workings proving too heavy for the machinery in use. At the 1,273-ft. level the east cross-cut was extended to 100 feet, where the footwall of a large body of quartz was found, and drives were put in north and south along the western edge of the formation. At 500 feet north the drive broke through to the New Normanby workings, and stoping over the level was commenced in payable stone. For 300 feet south the large body of stone carried fair gold in some places. At the 1,204-ft. level large quantities of ore of average quality were won, that in the north end going underfoot. The 7-ft. Slate country was intersected by a cross-cut west from the north drive. The south workings were chiefly in payable vein country. For the year 23,202 tons of ore crushed returned 6,654 oz. of gold.

In 1909 the main south drive at the 1,273-ft. level was extended to 517 feet on patchy ore. North of the cross-cut the drive was connected to the New Normanby mine. Stoping on the east side of the big lode proved low-grade ore, but a rise of 20 feet from a cross-cut at a point 80 feet

west of the east wall opened up a payable formation 12 ft. wide.

At the 1,204-ft. level quartz veins crossing the New Indicator gave fair returns. The tributers at the 1,064-ft. level worked veins north on the 7-ft. Slates, which yielded 5 dwt. to the ton.

At the 840-ft. level a rise from near the south face on the Indicator proved only two small quartz veins. The quartz vein worked by the Woah Hawp Canton Company was found in a winze 415 feet south of the cross-cut; it yielded 180 oz. of nuggets from a drive 115 feet long. This discovery caused work to be resumed at the 948-ft. level, where the south drive was extended to 156 feet along a quartz vein which pitched underfoot.

In 1910 successful operations on the Indicator veins enabled the company to resume paying dividends, £6,000 being distributed in the twelve months. At the 1,273-ft. level the east cross-cut was extended to the Indicator at 342 feet without meeting any ore of value. From the main north drive a body of quartz 30 ft. wide was cut on a flat fault, and proved payable over a length of 300 feet, the bulk of the stone crushed during the year coming from this formation. At the 1,204-ft. level prospecting in the south end of the mine failed to disclose any payable ore. At the 1,064-ft. level the south drive on the Indicator was continued to 290 feet, and a rise was put up to cut the quartz veins which pitched underfoot in the level above. A small payable quartz vein was worked on the Western Indicator in the north end.

At the 948-ft. level the south drive on the Indicator was continued to 425 feet, and reached settled country, carrying payable gold, after passing through 50 feet of broken country. At 345 feet a rise was put up, and cut a nuggety vein, which yielded 70 oz.; at 50 feet up a slide was cut, and above this and below another slide very rich quartz was worked on the Indicator. Payable quartz on the 7-ft. Slates was being opened up south of the main cross-cut. A drive on the Indicator veins below the 840-ft. level connected to the Woah Hawp Canton, a stope 15 feet high being taken out (p. 245). A rise over the level was put up 58 feet, and a south drive was put in on a quartz vein, but little gold was won in 40 feet of driving. The total yield for 1910 (including nuggets) was 7,164 oz. of gold from 19,853 tons of ore crushed.

For the first half-year of 1911 dividends amounting to £4,200, or 3s. 6d. a share, were paid, and a reserve fund of £1,000 was established, but during the second half, although a dividend of 6d. a share was paid in July, calls of 1s. a share were made. The exhaustion of the Indicator veins accounted for the falling in gold yield, and the cost of shaft-sinking added to the mine expenses. The shaft was deepened 100 feet, and a plat was cut for the 1,375-ft. level.

At a depth of 1,490 feet a drive was put in from the New Normanby mine for a distance of 207 feet, and gold-bearing quartz was found, which yielded 4½ dwt. to the ton.

The stopes on the 1,273-ft. level north on the big lode were in large bodies of poor ore, which became too poor to be worth extracting before the year ended; small quartz veins on the west side were payable. The south drive and stopes were also poor.

At the 1,204-ft. level, a rise on the Western Indicator holed through to the level above, passing through two quartz veins showing gold, on which drives were started. Prospecting on the Western make failed to prove any payable formations.

At the 1,064-ft. level, the rise on the Indicator was carried up 94 feet without result, but at this point a quartz vein which gave good returns was worked for 50 feet; but the country then became broken, and poor ore was followed to the boundary. In the north end, a patch of 260 oz. was found. A rise of 70 feet on the Western Indicator disclosed two unpayable quartz veins.

In 1912, notwithstanding vigorous prospecting on the Indicator at several levels, the results were poor. One dividend of 6d. was paid, and calls totalling 9d. were made during the year. The New Normanby Company left payable stone on the boundary at a depth of 1,500 feet, and arrangements were made for the working of this shoot in the North Woah Hawp mine from the new boundary drive. The stone proved to consist of rich flat makes pitching south. A block 20 ft. long and 25 ft. wide yielded 255 tons of ore, which gave 237 oz. of gold. These veins were in the west side of the drive driven from the New Normanby end in 1911.

At the 1,375-ft. level, the cross-cut east was driven 36 feet, and a north drive of 90 feet was put in on quartz; a rise of 33 feet from the end of the drive proved auriferous quartz over a slide, and an intermediate level was driven 220 feet north from the rise. Up to a small cross-course, the stone was fair, but beyond that poor; the stopes over the intermediate were about payable.

From the north face a cross-cut was put in 130 feet to test the lode met in shaft-sinking, but nothing of value was located. The Eastern lode workings at the 1,273-ft. level were let on tribute early in the year, and the yields from these ranged from 4 dwt. to 5 dwt. to the ton, the ore being won by stoping. At 450 feet south of the cross-cut, a rise met a large formation of fair value, and north some promising quartz veins were located. The west lode workings were also let in blocks, but the returns were poor throughout the year. At the 1,204-ft. level, the workings on the Western Indicator gave payable returns for a time, but later the quartz pitched south and became poor, so prospecting ceased.

At the 1,064-ft. level, some small quartz veins met with on the Indicator proved unpayable, while the ore from the western workings also was poor. The Indicator workings at the 948-ft. level were poor; the north drive carried two quartz veins showing gold, and was continued to 400 feet from the cross-cut; and in the south drive a face of stone was driven on, this also was poor. Some fair returns were obtained from the western formation, south of the cross-course.

At the 743-ft. level, a cross-cut east was driven towards the Indicator from the 4-ft. Slate at 720 feet south of the cross-cut, and a quartz vein showing gold was met on the Western Indicator,

where a rise of 35 feet proved the veins to be poor. For the year, 11,581 tons of ore yielded 3,843 oz. of gold.

Throughout 1913, operations were unprofitable, ten calls being necessary to carry on prospecting; although the deepest workings were on good stone, the other levels were poor. This led the company to sink the shaft an additional 35 feet towards the close of the year.

At the 1,500-ft. level, the workings from the New Normanby mine proved quartz veins for a length of 150 feet from the boundary; these yielded from 7 dwt. to 1 oz. to the ton, the bulk of the quartz coming from flat veins over a slide; but on the 7-ft. Slate a vertical body 8 feet wide was worked.

Above the 1,375-ft. level, the intermediate level proved a series of quartz veins, and was driven north to the New Normanby boundary on payable ore, while stoping was carried out on the western side of the drive. A cross-cut west from a rise 40 feet high, over the main cross-cut, was driven 75 feet, and passed through two bodies of quartz of poor quality. The main cross-cut was extended to 253 feet, and the Western Indicator cut, but no quartz was located. At the 1,273-ft. level, payable values were obtained for a few months from the tribute blocks on the east lode, but the quartz became small and poor.

At the 1,204-ft. level, prospecting on the Western Indicator by a south drive from a rise failed to locate anything payable, only low-grade ore being met. Nothing payable was met in the Indicator drive at 948-ft. level, which was carried to the boundary on these veins. The workings on the 7-ft. Slate also were poor. Rising above the 743-ft. level for 73 feet only located two small veins, which proved to be poor when driven on south. The Western Indicator was prospected to a cross-course which threw the country south-east; to this point a little gold was visible. For the year, 11,836 tons of stone were crushed for 3,146 oz. of gold.

Operations for the first half of 1914, though not profitable, showed a slight improvement on 1913. The shaft was deepened, and the 1,474-ft. level was opened out and a cross-cut east extended to 80 feet, entering the Big Sandstone. At 15 feet east of the shaft, a make of gold-bearing quartz was intersected on the 7-ft. Slate, and driving north started. From the New Normanby end, the quartz veins were opened over the level, and proved payable. The stopes from the intermediate workings over the 1,375-ft. level reached the 1,273-ft. level, and some rich spurs were met at times in the Big Sandstone, but the bulk averaged only 4 dwt. A large formation was prospected by a south drive at 30 feet below the 1,273-ft. level. At the 1,204-ft. level, the stopes in the south end yielded the bulk of the ore treated; this was of fair quality, while the north end was poor. Above the 1,204-ft. level, a cross-cut east was started from a rise 60 feet high in a cross-cut east 60 feet from the south drive at 240 feet south of the main cross-cut and 180 feet east of the shaft.

From the top of this rise an intermediate level was driven south, and was connected with the 1,137-ft. level on the Western Indicator line. Two patches of 100 oz. each were found below Horley's workings, but 70 feet of driving beyond this point revealed no colours of gold. The veins were stoped across from the Mundic Grit to the Western Indicator. The Indicator veins at the 948-ft. and 743-ft. levels gave only poor returns.

During the latter half of the year 1914 the drive north at the 1,474-ft. level, at 15 feet east of the shaft, was continued to 282 feet, intersecting a number of quartz veins which yielded up to 6 dwt. of gold to the ton. A connexion was made from the north drive by a cross-cut east to the New Normanby south drive (1,500-ft. level), and some flat quartz veins were passed through up to 1 ft. 3 in. wide, and auriferous. Poor quartz was met with in the 1,375-ft. and 1,273-ft. level stopes, but payable veins were worked on the Indicator at the 840-ft. and 948-ft. levels.

In 1915 the output fell away, owing partly to the poor quality of the ore in sight, and partly to the shortage of miners, owing to the war conditions. At the 1,474-ft. level the reef on the north boundary became small and poor in the level, while to the west of the drive the stopes opened large bodies of low-grade ore. Payable returns were obtained early in the year from above the main drive at 60 feet north of the cross-cut, where a body of stone 3 ft. wide was mined. South of the cross-cut a rise passed through several flat veins showing gold, but these did not develop into sufficient size or quality to extract. At the 1,375-ft. level the north stopes were worked to 1,273-ft.-level on ore of low grade, while southwards over the intermediate the values were not profitable. At the 1,273-ft. level the quartz veins east of the main lode were about payable, while those to the west were poor during the first term, but averaged 5 dwt. to the ton during the latter half year. Above the 1,204-ft. level a rise of 70 feet on the Indicator intersected the Slide, and a winze sunk from the 1,137-ft. level, as a connexion, failed to locate quartz veins of value. Quartz veins east of the Indicator were worked at the 840-ft., 948-ft., and 1,061-ft. levels, and at the 1,064-ft. level some payable veins were worked west of the former stopes, both north and south of the cross-cut. Towards the end of the year a drive south on the Indicator from a rise above the 1,068-ft. level, at the intersection with a slide, yielded some rich specimens, from which a yield of 153 oz. 18 dwt. of gold was obtained; this was 250 feet north of the Woah Hawp Canton boundary.

In 1916 the drive on the Indicator above 1,064-ft. level was continued for over 200 feet, but no further specimens were obtained, the country being much broken. North at this level quartz veins of low grade were worked west of the old stopes on the main slide.

Small quartz veins were worked on the Indicator at the 840-ft. and 948-ft. levels. At the 1,273-ft. level veins on either side of the Eastern lode ranged up to 5 dwt. to the ton, but fell away towards the end of the year.

Payable ore was mined above the 1,474-ft. level early in the year on the western side of the slide. On the Big Sandstone country a make of quartz 3 ft. wide yielded 9 dwt. to the ton for some time. At a depth of 1,530 feet a drive was put in 50 feet from the New Normanby mine on a body of quartz 6 ft. wide of low grade. Owing to the cessation of operations at the New Normanby mine, and the consequent flooding of the lower levels, work ceased in the lower levels of the North Woah Hawp mine at the end of 1916.

The following gold yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1888 .. .. | 5,044 | 1,473 | 9 | 0 |
| 1889 .. .. | 6,667 | 4,811 | 5 | 6 |
| 1890 .. .. | 8,196 | 3,008 | 2 | 18 |
| 1891 .. .. | 6,703 | 2,295 | 11 | 0 |
| 1892 .. .. | 8,878 | 2,907 | 4 | 12 |
| 1893 .. .. | 8,155 | 3,667 | 19 | 0 |
| 1894 .. .. | 11,470 | 4,166 | 4 | 0 |
| 1895 .. .. | 8,969 | 3,459 | 13 | 0 |
| 1896 .. .. | 6,665 | 2,646 | 9 | 18 |
| 1897 .. .. | 5,346 | 1,913 | 13 | 18 |
| 1898 .. .. | 8,037 | 2,989 | 16 | 0 |
| 1899 .. .. | 14,077 | 4,107 | 1 | 4 |
| 1900 .. .. | 15,554 | 5,621 | 9 | 0 |
| 1901 .. .. | 14,954 | 6,156 | 12 | 18 |
| 1902 .. .. | 10,919 | 6,185 | 5 | 0 |
| 1903 .. .. | 14,476 | 7,447 | 17 | 12 |
| 1904 .. .. | 24,449 | 8,062 | 12 | 0 |
| 1905 .. .. | 28,219 | 7,577 | 9 | 12 |
| 1906 .. .. | 11,345 | 4,458 | 10 | 0 |
| 1907 .. .. | 19,868 | 6,589 | 1 | 18 |
| 1908 .. .. | 23,866 | 6,777 | 14 | 0 |
| 1909 .. .. | 20,911 | 5,671 | 4 | 10 |
| 1810 .. .. | 19,853 | 7,163 | 14 | 0 |
| 1911 .. .. | 15,225 | 6,220 | 1 | 0 |
| 1912 .. .. | 8,081 | 2,539 | 12 | 0 |
| 1913 .. .. | 11,936 | 3,146 | 3 | 0 |
| 1914 .. .. | 10,767 | 2,756 | 3 | 0 |
| 1915 .. .. | 8,585 | 2,483 | 18 | 0 |
| 1916 .. .. | 6,184 | 1,259 | 15 | 0 |

The total tonnage to the end of December, 1916, was not recorded.

Gold obtained was valued at £574,387 15s. 11d.

Dividends paid, £52,650.

Royalty paid, £29,701 4s. 1d.

SOUTH WOAH HAWP COMPANY.

(Pl. xxvii.)

The South Woah Hawp Company began operations in 1903, securing the shaft of the North Prince Regent Company, which was sunk to a depth of 774 feet. The shaft was deepened to 1,200 feet, but prospecting operations, carried on for several years, failed to locate any of the large bodies of quartz so successfully worked in the North Woah Hawp Company's mine, adjoining on the north. This was the more unfortunate, as a considerable length of ground to the south between this mine and the large cross-course yielded rich returns from the shallow levels. Throughout this mine ventilation was bad, but after it closed down the Woah Hawp Canton Company effected a connexion from their No. 1 shaft to the bottom level, which drained the mine and provided a good air-way. Operations ceased in 1910.

*Details of Workings.*

When operations began in 1903, the shaft was repaired to a depth of 769 feet, and the 375-ft., 425-ft., 485-ft., 704-ft., and 769-ft. levels were re-opened. At the three upper levels the east crosscuts were extended, and veins were cut, on which drives were put in north and south. At the 704-ft. level the west cross-cut was repaired for 80 feet, where a drive south yielded small crushings of low-grade quartz. The chief work was at the 769-ft. level, where the west cross-cut was repaired for 107 feet. On the 4-ft. Slate at 100 feet west a drive south was repaired and extended to 106 feet on 2 feet of low-grade quartz. At 56 feet south a rise of 8 feet over the level proved a body of quartz, which was payable for a length of 50 feet. The main drive north on the 4-ft. Slate was continued for 150 feet, where broken country was intersected. A stope over the main drive proved a make of payable quartz 30 feet wide.

The shaft was sunk to a depth of 893 feet during 1904, and a cross-cut west was opened at 850 feet from the surface. At 75 feet from the shaft a rise, put up on a 6-in. slate bed in the Big Sandstone, cut 3 feet of poor quartz. At 132 feet the cross-cut intersected the cross-course on which a short drive was put in south-west along 3 feet of poor quartz. At 110 feet a rise was put through to the 769-ft. level on the 4-ft. Slate, and 17 feet over the cross-cut a slide carrying quartz was cut; but a trial crushing proved that it was poor.

During 1905, at the 769-ft. level, a fair amount of payable quartz was obtained, the stone ranging up to 20 feet in width, but this was exhausted before the end of the year.

The shaft was sunk to a depth of 1,116 feet during 1905, and a level was opened at 950 feet. The east cross-cut passed through a leather jacket at 17 feet, and the Western Indicator at 65 feet, where a rise was put up; the west cross-cut was continued to 280 feet from the shaft, but proved nothing of value.

In 1905, at 1,025 feet cross-cuts were opened east and west. At 50 feet east the Western Indicator was reached, and the cross-cut was then stopped. The western cross-cut passed through the 4-ft. Slate at 130 feet from the shaft; on this belt of slate a south drive was put in 38 feet, but the quartz in the drive was unpayable, and no further work was done here.

The 1,100-ft. level was opened towards the end of 1905, and a west cross-cut was put in 370 feet. At 56 feet it intersected the 12-ft. Slate, which carried a large quantity of barely payable quartz. At 82 feet a strong make of quartz on the Big Sandstone yielded a little over 4 dwt. of gold per ton. At 95 feet a leather jacket slide cut off the quartz. At 117 feet the cross-course was intersected, and on this a drive south-west was put in for 55 feet in a fair body of quartz, showing gold as far as the 4-ft. Slate, where the quartz was 4 feet wide. At 157 feet from the shaft, on the 7-ft. Slate, a make of quartz 3 feet thick yielded 5½ dwt. of gold per ton. At 162 feet west drives north and south were opened on a flat make, which attained a width of 20 feet, and the first crushing yielded 28 oz. 10 dwt. of gold from 62 tons of quartz.

No. 1 drive south, at 80 feet west of the shaft, was continued to 90 feet from the cross-cut, with a body of quartz 30 feet wide on the western side of the drive; the values were low, although the quartz veins contained some rich specimens. The No. 2 drive south (from 25 feet along the drive) on the cross-course 117 feet from the shaft was continued to 273 feet from the cross-cut; a fair body of quartz was followed to 233 feet, where a small cross-course occurred, beyond which the lode was disturbed. Stoping and "winging off" on this drive produced a large quantity of quartz during 1906. A rise on the 4-ft. Slate to the 1,025-ft. level passed through two small makes of quartz.

A large body of payable quartz opened during 1906 and 1907, at 160 feet west of the shaft, north on the 7-ft. Slate, yielded from 6 dwt. to 11 dwt. of gold per ton.

During 1907 the shaft was sunk to a depth of 1,185 feet, and a cross-cut was opened at 1,175 feet. A cross-cut west was put in to find the continuation of the lode worked in the level above, but 166 feet of driving failed to intersect more than a few veins of quartz. A drive was put in south-west on the cross-course for 30 feet to the 4-ft. Slate, on which a gold-bearing vein 1 ft. 6 in. wide was cut; in a drive driven south for 50 feet this vein did not increase in size or value.

A drive north was put in 30 feet, and also a rise to the quartz worked in the level above. The east cross-cut at 41 feet east of the shaft cut the Western Indicator with two small quartz veins showing gold. A drive south on the formation for 50 feet and a rise of 30 feet over the drive failed to locate any quartz. Work at this level ceased during 1908 but was resumed in 1909 when the south drive on Western Indicator was extended.

Prospecting at the 845-ft., 765-ft., and 700-ft. levels, in 1908 and 1909, revealed only unpayable quartz and work ceased early in 1910.

The following yields were recorded:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1891 .. .. | 70 | 147 | 5 | 0 |
| 1892 .. .. | 36 | 82 | 4 | 0 |
| 1893 .. .. | 170 | 153 | 4 | 0 |
| 1894 .. .. | 173 | 341 | 15 | 0 |
| 1895 .. .. | 10 | 23 | 7 | 0 |
| 1904 .. .. | 1,321 | 341 | 10 | 0 |
| 1905 .. .. | 801 | 214 | 6 | 0 |
| 1906 .. .. | 5,191 | 1,200 | 1 | 0 |
| 1907 .. .. | 359 | 63 | 15 | 0 |
| 1908 .. .. | 2,045 | 483 | 2 | 0 |
| 1909 .. .. | 1,194 | 378 | 4 | 0 |
| 1910 .. .. | 160 | 12 | 5 | 0 |

WOAH HAWP CANTON COMPANY.

(Pl. xxviii.)

This mine was taken up by a party of Chinese in about the year 1882. Prior to this the shallow levels had been worked, but were abandoned on reaching water level. As operations on Pearce's lease proceeded, the water level was lowered, and work was then resumed. The Chinese company was successful in locating many rich patches on the Indicator, but, being a private concern, these were rarely recorded. Mr. E. Hardy, who for many years acted as manager to the company, states that the gold sold from the mine from its inception up to July, 1901, amount to 58,130 oz.

A company called the Sun-You-Hing then held the area for some time, but their operations in the old levels were not successful. In 1908 a Geelong syndicate secured the claim, and shortly afterwards the Woah Hawp Canton Mines Company N.L. was formed.

At the date of commencing operations the main shaft was 650 feet in depth. Shaft sinking was resumed, and in June, 1909, a depth of 852 feet was reached. At this level a cross-cut west cut the Indicator, but no gold was found. The company having spent nearly £9,000 was on the point of suspending operations when a gold-bearing vein was intersected 40 feet up in a rise from the 852-ft. level. Within a fortnight of striking this vein nuggets of 220 oz., 154 oz., 60 oz., 43 oz., and 5 oz. respectively, were obtained, while from a crushing of 40 tons of quartz an additional 80 oz. was obtained, making a total of over 560 oz. The vein was about 1 foot thick where first intersected, and was driven on to the north and to the south. In July additional nuggets of 142½ oz., 9 oz., 60 oz., and 150 oz. were obtained. These yields enabled the company to build up a reserve fund for future development work. On and above the 852-ft. level operations on the veins on the Indicator were continued throughout the remainder of the year with satisfactory results. The main north drive was in 220 feet, and the south drive a distance of over 70 feet. A rise was put up for 100 feet, and the 752-ft. level was driven on a vein which carried a shoot of comparatively small gold.

In 1910 shaft sinking was resumed, and levels were opened out at 928 feet and 1,004 feet from the surface. Operations in the upper levels were also resumed, but the results were not satisfactory. At the 328-ft. level the Ribbon Slates and the Eastern Indicator lines were prospected. At the 520-ft. level the Western Indicator and Mundic Grit lines were tried, and much quartz was found, but it was of low-grade, and unprofitable to work. At the 752-ft. level the north drive on the Indicator was continued in a body of poor quartz to the boundary, a distance of 296 feet. The south drive on the Indicator was also continued to 310 feet, where a payable vein of quartz pitching to the south was driven on in an intermediate drive over the main level. At 355 feet in from the cross-cut a cross-course was met with, and threw the Indicator 6 feet to the west. At the 852-ft. level the north intermediate drive on the Indicator was continued to the lease boundary in highly payable quartz, from which nuggets of varying size were obtained (Fig. 24, p. 116). This drive was connected to the main level. South the main Indicator drive was continued to 328 feet, but no quartz vein was met with. The intermediate level driven from the 40-ft. rise was then driven until the vein pinched out at 100 feet from the rise.

On the Western Indicator at the 852-ft. level a rise was put up, and passed through several quartz veins, but these were poor. Some cross-cuts were put in east of the Indicator without meeting any payable quartz. At a depth of 930 feet a new level was opened out west to the Indicator, where a rise was put up to the 852-ft. level passing through a body of broken quartz, and here a main north drive was put in to meet the Indicator north of the cross-course. North of the cross-course a rise passed through two small quartz veins before meeting a large one at 50 feet above the level. Driving on this vein yielded a large number of nuggets ranging up to 100 oz. in weight, and the vein ranged from 1 ft. up to 4 ft. in width. On the Western Indicator a rise was put up, but only cut some small veins of quartz.

At a depth of 1,004 feet a cross-cut to the west passed through the Indicator without meeting with any quartz, and a rise put up to the 930-ft. level failed to locate any quartz veins on the Indicator. The stopes on the quartz veins on the Indicator above and below the 852-ft. level yielded, besides nuggets, good crushing ore during the year. In November, 1909, shaft sinking was resumed.

During 1910 Tinworth's mine was purchased, and their shaft now formed the No. 2 shaft of the company. This shaft was unwatered and repaired, and work was undertaken at the 293-ft. level, but work here proved unprofitable. At the 372-ft. level a rise was put up at a point 175 feet to the north of the shaft, and proved nothing of value. At the 752-ft. level a drive on the Western Indicator was repaired. At the 852-ft. level the west cross-cut was repaired, and an intermediate level over the drive was re-opened and driven in a northerly direction. This drive connected with the main shaft workings and ensured a good air supply.

In 1911 work was confined chiefly to the main shaft, which was sunk to a depth of 1,170 feet

by the end of the year. A second shaft, formerly the Corn Exchange, was purchased, and a plant erected on it in November, 1911. The good returns of the previous and the early portion of the present year were not maintained, and calls were resorted to in order to carry on development work. At the 752-ft. level a small quartz vein was tried on the Streaky Slates, but it proved of poor value. On the Western Indicator a small vein was cut at 40 feet above the level, and this showed gold. It was driven on south, but the stone pinched, and the main rise was then continued, without proving anything of value, so the level was abandoned in April, 1911. At the 852-ft. level a trial crushing, which proved poor, was taken out from Dunk's Slate early in the year. The overhead stopes on the Indicator were exhausted early, but the underhand stopes continued to give a fair supply of stone, and a cross-cut was put out east for 228 feet passing through clean strata free from quartz. At the 928-ft. level payable stone was obtained from the stopes and the intermediate levels, the quartz ranging from a few inches up to several feet in thickness. These stopes lasted until August. In March the 1103-ft. level was opened and a west cross-cut from it passed through the Indicator and met a fault at 71 feet. At 40 feet a rise was put up on the Indicator, and passed through disturbed beds. The drive south on the Indicator was put in 33 feet. The north drive was extended to 110 feet by August, and rises were put up to prospect for gold-bearing quartz veins. On the Western Indicator a rise was put up to the 1,004-ft. level, and a south drive along it carried small veins of quartz. At the 1,004-ft. level work was resumed. The north drive was put in 140 feet, and two rises were put up, which passed through strata broken by slides. These rises located payable stone, which was worked until August, 1911.

In 1912 the company purchased the adjoining lease held by the South Woah Hawp Company, and a connexion was made above the 1,100-ft. level from the main level with the workings of that company, which enabled that mine to be drained and also provided good ventilation. At the No. 2, or Corn Exchange shaft, a plant was erected, and the shaft repaired to the bottom, a distance of 450 feet. Several hundred feet of old levels were repaired, and over 500 feet of new drives were put in, cutting only small quartz veins, which either cut out or were worked to old ground. During the year this shaft was closed down, and remained idle until 1915, where further sinking was undertaken.

Early in 1912 sinking in the main shaft was completed, and the 1,204-ft. level was opened. A west cross-cut at this depth passed through




Fig. 65.—Syncline and Anticline showing folding of the Indicator 1,204-ft. level, Woah Hawp Canton Mine. Scale, 40 feet to 1 inch.

the Indicator at 55 feet, on which a rise was put up to the 1,100-ft. level. The Western Indicator was cut 185 feet from the shaft, and a rise was put up on it without proving anything of value. At 146 feet from the shaft a south-westerly drive along a cross-course met the Western Indicator on the south side of it at 100 feet from the main cross-cut. After 164 feet of driving a west cross-cut was put in to test the western country in the vicinity of the South Woah Hawp workings. In the southern cross-cut at 110 feet from the shaft, quartz yielding 5 dwt. to the ton was met with and worked. At 30 feet to the west of this the 4-ft. Slate was intersected. The cross-cut was then continued to 259 feet. At 220 feet from the shaft a leather-jacket which carried a small make of quartz, was passed through, but it was not driven on.

At the 1,103-ft. level the south drive on the Indicator failed to disclose payable quartz, so it was discontinued at 180 feet south of the cross-cut. On the Western Indicator a drive south passed into the cross-course at 40 feet, and was driven to 70 feet before picking up the line again. At 175 feet southerly from the main cross-cut another cross-cut was driven west, locating quartz at 80 feet and 140 feet from the south drive. The quartz at 140 feet gave payable returns for some time, and was worked to the north and to the south. In the south drive the stone was taken out 30 feet in width, and was tested to a height of 30 feet. An examination of the South Woah Hawp workings showed that much solid ground was left in the levels. The cross-cut was extended to 267 feet from the south-west drive before work ceased at this shaft in 1913.

In 1915 work was resumed at the No. 2 Corn Exchange shaft, and a sink of 120 feet was completed, and a cross-cut to the west was then commenced. Although forming portion of the eastern limb of the anticline, the strata passed through dip 70 deg. to 85 deg. to the west. At 78 feet west of the shaft the Indicator was cut on the south side of a small cross-course, which heaved the Indicator 9 feet, and had a throw of 18 feet. A drive to the south along the Indicator followed a gold-bearing vein, which averaged on crushing about an ounce to the ton. This vein was of small size, and pitched to the north at the rate of 1 foot in 12 feet. At 20 feet south of the cross-cut a rise was put up 15 feet, and passed through small threads of quartz.

North from the cross-cut at 69 feet west of the shaft a drive was put in, which cut the Indicator on the north side of the cross-course at 20 feet from the cross-cut. The drive followed along the Indicator for 195 feet, where a large cross-course was struck. A north pitching vein, and also some parallel planes without quartz were met with in the drive. On the large cross-course a rise was put up, and at 15 feet over the back a quartz vein was cut and driven on to the south for 120 feet, continuing small, but gold-bearing. At 110 feet up in the rise a quartz vein was cut and followed south to the workings below the 450-ft. level. Some small nuggets were taken from this vein northwards from the cross-course, the main level was extended, and a branch of the large cross-course was passed through at 57 feet, the strata being much disturbed. At 300 feet north of the main

cross-cut, another cross-cut bearing north-westerly was put in for 100 feet. This cross-cut passed through an anticline at 75 feet from the main north drive, besides several small quartz spurs and a leather jacket (slide) on which no work was done. The mine was closed down in July, 1916.

### N. W. INDICATOR COMPANY.

(Pl. xxix.)

This company, formed towards the end of 1909, began operations by cleaning out the shaft formerly known as Mullin, the Indicator and the Mazeppa, where the water stood at 350 feet from the surface.

The water was reduced to a depth of 572 feet, where an old drive was repaired to the face at 200 feet south, and driving was continued on the Indicator. At 250 feet in the drive a 6-in. quartz vein was cut and followed to a cross-course at 276 feet. A drive south-east along this cross-course located the Indicator at 165 feet, within 16 feet of the Reward Company's boundary; a winze was sunk and a connexion made with the workings of the Reward mine. The cross-cut west of the shaft was repaired and a rise was put up on the 12-ft. Slate at 260 feet; at 25 feet over the level there were a number of quartz veins on which a little work was carried out.

At a depth of 427 feet No. 4 level was driven south on the Streaky Slates and quartz veins yielding up to 7 dwt. of gold per ton were located. The veins pitched north at 1 in 40. At the No. 5 level, 478 feet from the surface, a flat make of quartz 9 inches thick and intersecting the Indicator was followed north and south for 80 feet each way. Rises had been put up on the Indicator by some former parties, but the results were not recorded.

Early in 1912 work ceased owing to failure to locate payable quartz in the old workings; the adjoining Reward mine closed down for the same reason.

The section exposed in the mine consists of the eastern limb of an anticline. Owing to an overthrust, a westerly inclination is in places given to the beds. A felsite dyke dipping west at 1 in 2 is exposed at the 173-ft. and 573-ft. levels.

### REWARD MINE.

(Pl. xxix.)

This mine, which was worked from 1909 to 1912, was privately owned by a Melbourne citizen. The shaft was sunk to a depth of 690 feet, and levels were opened at 152, 237, 361½, 430, 527, 577, and 677 feet. Operations were confined chiefly to prospecting quartz veins intersecting the Indicator. Much unpayable quartz was located. The Indicator usually dipped west; and, with a western dip here and in other mines on the line, no gold was located.

#### *Details of Workings.*

*677-ft. Level.*—A cross-cut west for 70 feet on the south side of the shaft passed through strata dipping from 75 degrees west to 88 degrees east. At 53 feet the Indicator was located, and a rise was put up to the level above. At 40 feet west of the shaft a drive was put in south for 70 feet on quartz veins pitching north at 1 in 40.

*577-ft. Level.*—The cross-cut west passed through a flat slide or leather jacket at 20 feet from the shaft. At 47 feet drives were put in north and south on the Indicator above the slide. At 54 feet the top of the rise from the level below reached the crosscut. The strata dipped west at 70 degrees to 80 degrees. A little quartz was associated with the leather jacket and the slates contained arsenopyrite, and decomposition products such as arsenolite and realgar were plentiful in the crushed strata. The south drive at 47 feet west carried a big make of quartz for 500 feet. At 100 feet south a cross-cut east proved the formation to be over 20 feet wide. Several rises were put up to test the formation, which underlay west and pitched north, but the ore was poor.

East of the shaft the crosscut was put in 58 feet through clean strata dipping west 80-87 degrees.

*361½-ft. Level.*—This level affords the typical section of the mine. The cross-cut west was put in 620 feet. At 25 feet from the shaft is the Indicator, dipping 80 degrees W.; drives were put in north and south along it. From 40 feet to 70 feet from the shaft the Blocky Slate was exposed, showing several thin associated sandstone ribs. At 111 feet from the shaft a slate with mineral seams, probably the Western Indicator, was cut. At 120 feet a drive south followed the eastern edge of a felsite dyke, probably identical with the one exposed in the Indicator mine to the north. It appears probable that considerable fault movement has taken place along the fault now occupied by the dyke as the strata to the west cannot be correlated with that in the North Woah Hawp mine beyond this point. A large amount of sandstone exists between 140 feet and 210 feet west of the shaft and this would agree with the Big Sandstone of the northern mines if a movement to allow for 50 feet of horizontal displacement be assumed. This would also allow for the 4-ft. Slate being exposed at 210 feet and the 7-ft. Slate at 250 feet to 260 feet. From 290 feet west slate beds predominate to an extent not known elsewhere along the Indicator belt. A wide bed of slate at from 510 feet to 610 feet from the shaft probably contains an anticlinal fold, although no evidence could be obtained, but in the face at 620 feet there are strata dipping west. The beds from the shaft to 100 feet dip on the average 81 degrees west, but they are overfolded, being on the east limb of the anticline; from 100 feet to 130 feet the dip is east at 83 degrees to 88 degrees; from 130 feet to 300 feet the dip varies from 75 degrees to 85 degrees west and the cleavage 72 degrees west; from 300 feet to 450 feet the dips vary between 65 degrees west and vertical; and from 450 feet to 500 feet the beds are vertical; from this point to the shaft, the beds form the portion of the eastern limb of the anticline, the centre of which is probably at 550 feet west of the shaft.

### WOAH HAWP NO. 1 COMPANY.

(Pl. xxx.)

#### *Introductory.*

The area held by this company is secured under miner's right title, and extends 350 feet north and 700 feet south of the main shaft, which was originally known as Lester's, named after the man by whom it was worked to a depth of 400 feet. After Lester, the British Queen Company obtained possession, and sunk the shaft to a depth of 900 feet, and worked with varying success until 1903, when the present company secured the ground. Other shafts within the claim were sunk by Donovan, Carton, and Turpin to the south, and by Crockford and McDonald to the north. Hanthorn's workings lie to the west. The shafts were mostly shallow, not below 300 feet, and were worked by windlass, whip, whim, and occasionally by steam power.

When the Woah Hawp No. 1 Company began operations, it was found that the British Queen shaft required repairs, which were effected prior to sinking. A depth of 1,112 feet was reached by August, 1904, and plats were cut for the 991-ft. and 1,090-ft. levels. On cross-cutting at the 1,090ft. level a large body of quartz was found 168 feet west of the shaft, and proved to be highly auriferous. This formation was 20 ft. wide, and varied in value from 6 dwt. up to 2 oz. to the ton. At 50 feet south of the cross-cut the shoot of gold pitched underfoot, but continued strong in the north drive for over 180 feet; 1,156 tons of quartz taken from these drives yielded 988 oz. of gold, an average of over 17 dwt. of gold per ton for the half-year ending February, 1905. The company now began to pay dividends, distributing £1,800 for the half-year, and also purchased 20 heads of stampers, complete with engine, housing, &c., at a cost of £1,005. Shaft-sinking was resumed, and a cross-cut was commenced at the 1,188-ft. level before August, 1905, with the object of intersecting the downward continuation of the quartz discovered at the 1,090ft. level. Before the close of 1905 it was necessary to make calls. The 1,188-ft. level failed to intersect ore of the same quality as that in the 1,090-ft. level, and a connecting rise met with no better results; this caused more attention to be paid to the 1,090-ft. level, where the lode was located north of the cross-course, which had displaced it north-easterly, and had also elevated the country on the north side.

*Structure.*

This mine occupies an interesting position on account of its comparative isolation, and also on account of the rather remarkable character of the gold occurrences; from the surface to the deepest (1,188ft.) level a series of payable veins and spurs have been located at various points in the cross-cuts, but in the drives, both north and south, the gold values rapidly diminished.

The chief feature of the mine is a series of beds forming the eastern limb of an anticline, which shows at 360 feet west of the shaft at the 499-ft. level. The syncline is exposed in the plat at the 1,188-ft. level. Notwithstanding a marked westerly list of the fold, overfolding of the strata is absent, only a local drag in the vicinity of the faults being met with.

A number of faults of the leather jacket type (slides) occur, but their continuity, owing to the limited amount of cross-cutting, cannot be established. The shaft passed through the main fault-channel at 50 feet below the 695-ft. level, where it is also exposed in the east cross-cut at 30 feet east of the shaft. The Indicator, which above the fault lay 7 feet east of the shaft, was displaced by the fault into the shaft, where it remained to a depth of 860 feet; at this point, it was disturbed by a second fault, which threw it 30 feet west of the shaft at the 892-ft. level. At 25 feet below the 892-ft. level, a third fault, the lowest of the series, was cut in the shaft. This third fault shows at the 991-ft., 1,090-ft., and 1,188-ft., levels west of the shaft, at 110 feet, 160 feet, and 260 feet respectively. A parallel fault of the same type was met with in the upper levels, passing through the shaft at a depth of 314 feet, and lying 120 feet west of the 402-ft. level. This fault carried large bodies of profitable quartz.

The Indicator in this mine consists of a seam of bright iron pyrites on the western edge of a bed of sandstone 4 feet thick. The pyrites is nearly always present, and the seam has been traced through from level to level. The Western Indicator was identified at the 991-ft. level where, in a north drive, a mineral seam is exposed on the east side of the level, at about 95 feet to the west of the Indicator. At the 1,188-ft. level, at 260 feet west of the shaft, a wide belt of slate, with a pith or slide, and containing a seam of pyrites ½-in. wide, was noticed in the stopes on auriferous spurs.

Th correlation of the Indicator from the 1,090-ft. level upwards appears feasible, but the pyrite seam at the 1,188-ft. level lies nearer the large slate bed than in the levels above. Correlating the strata in this mine with the northern mines (*e.g.*, the New Normanby and North Woah Hawp, see pp. 234 and 238), a large slate bed, 24 ft. wide, and known as the Blocky Slate, is noticed at 15 feet west of the Indicator, at the 1,188-ft. level. At 108 feet from the shaft, a seam of pyrites occupies the position of the Western Indicator, being here 95 feet west of the Indicator. The Big Sandstone, a typical bed in the New Normanby mine, is not identifiable in this mine, but at the requisite distance from the Indicator, a preponderance of sandstone is visible at the 1,090-ft. level, between 212 feet and 242 feet from the shaft. At 20 feet west of this, 262 feet to 270 feet, a slate similar in appearance to the 4-ft. Slate of the North Woah Hawp mine is exposed: while at about 30 feet further west, there is a larger bed (the one carrying the pyrite seam in the 1,188-ft. level), corresponding to the 7-ft. Slate of the northern mines. Though there is a marked absence of similar beds and features in the intervening strata, a rough connexion can be established with the mines over a mile distant.

The chief workings in the mine, especially in the upper levels, are confined to the beds immediately west of the Indicator, and within a width of 120 ft. Two cross-cuts only were driven to the east. The bulk of the quartz mined was obtained from spurs associated with the main leather jacket fault (known in this mine as "the slide"). At the 892-ft. level, most of the quartz came from over the fault, while below that level the stone was obtained from under the fault. The 1,188-ft. level workings at 300 feet west of the shaft all lie over the fault, but evidence was available to show that these spurs were intimately connected with the anticline. At the 1,090-ft. level, a rich make of quartz was worked north for 180 feet, but the values did not extend above or below the level. As a rule, the veins with a northerly pitch are the best, and in the 1,090-ft. level south drive on the Mundic Grit, 105 feet west of the Indicator country, a vein with an undulating pitch was proved to carry the best gold when the pitch was northerly.

Two dykes occur in the mine, and, though no connexion could be traced between them and the deposition of gold, their presence in the vicinity of the rich formation at the 1,090-ft. level, 105 to 160 feet west of the shaft, was noticeable. The eastern dyke has a somewhat vertical course; at the 1,188-ft. level, it is 2 ft. wide, and is apparently conformable with the strata; at the 1,090-ft. level, it is accompanied by a vein of quartz, and dipping easterly, it cuts across the beds, which here are dragged to a westerly dip of 75 deg; at the 991-ft. level, where it lies to the west of the course of

the western dyke of the 1,090-ft. level, it is 1 ft. wide, and apparently conformable with the beds. This dyke apparently belongs to the basic series (see p. 55).

The western dyke of the 1,090-ft. level is associated with the leather-jacket fault. It is of the felsite type, and is apparently similar to the pug and sediment of the northern mines. This dyke shows conspicuously at 260 feet west of the shaft, and extends through the stopes north and south, but was not noticed in the levels above or below the 1,090-ft. level.

*Details of Workings.*

*1,188-ft. Level.*—A syncline shows in the plat on the north side of the shaft. The west cross-cut passed through a series of beds dipping easterly at 85 degrees to 88 degrees. Dolomitic veins are of common occurrence. At 188 feet west of the eastern side of the shaft a rise connects to an intermediate level below the 1,090-ft. level. Between 250 feet and 300 feet west of the shaft quartz spurs are numerous, and a drive was put in northerly at 267 feet west. At 312 feet west another drive north and south opened a series of auriferous quartz spurs over a width of 25 feet. These spurs dipped east at 1 foot in 4 feet, and were partly in a bed of grey slate containing a pith or slide and also a well-defined seam of pyrite.

*1,090-ft. Level.*—The cross-cut at this depth for over 100 feet passed through slightly overfolded strata, the beds on the eastern limb having a dip of 83° to 87° west. At 13 feet west of the western side of the shaft the Indicator shows a thin seam of pyrite. At 108 feet the eastern dyke and the Western Indicator (a seam of pyrites) intersect. At 120 feet west of the shaft a large body of poor quartz on the Mundic Grit country has been tested. Between 250 feet and 270 feet west of the shaft, a spurry formation associated with a leather jacket fault and felsite dyke yielded quartz carrying up to 2 oz. of gold to the ton. The cross-cut extends to 307 feet westerly in clean strata dipping 80° to 85° east. The south drive at 120 feet west of the shaft was put in along payable quartz on what is regarded as the Mundic Grit belt of country; the veins, which varied greatly in value, were stoped above and below the level for a length of 250 feet south of the cross-cut. At 230 feet west of the shaft, another drive (No. 2 south) carried quartz veins, which were stoped to 25 feet above the level for a width of 10 feet, and for a length of over 50 feet from the cross-cut. At 150 feet north of the cross-cut, the north drive followed along the course of a dyke, (the Elvan); the quartz in this vicinity was of good value, 1,000 tons from north of the cross-cut averaging 15 dwt. of gold to the ton. The dyke at 50 feet north was nearly 3 ft. wide, and nearly vertical, and the quartz veins on both sides were worked to the level above, and downwards to an intermediate level. At 74 feet north of the cross-cut was a small cross-course which displaced the beds 10 feet to the east. The quartz was stoped at 150 feet north, the Elvan dyke being traced throughout.

*991-ft. Level.*—On the north side of the plat, a drive was put in for a length of 60 feet on the Streaky Slate, several small veins which carried gold when pitching north, being followed. A small cross-course with a 2 feet displacement to the right hand was intersected 52 feet north, and at 5 feet further north another with 1 foot displacement. At 110 feet west of the shaft drives north and south were put in, and ore was stoped above and below the level. At 65 feet north of the cross-cut a cross-course with a right hand displacement of 8 feet was passed through.

*892-ft. Level.*—A north drive from the west cross-cut at 32 feet from the shaft passed through broken country for over 50 feet. At 89 feet north-east of the main cross-cut an eastern cross-cut intersected a formation at 33 feet, which was stoped for 30 ft. wide and from 25 ft. to 30 ft. high, pitching north. This make was worked 20 feet south and 60 feet north.

The upper levels, with the exception of the cross-cuts, were closed during the survey.

The following yields were recorded from 1904:—

| Year. | Ore Crushed. | Gold Yield. | | |
|---|---|---|---|---|
| | tons. | oz. | dwt. | gr. |
| 1904 .. .. | 1,727 | 873 | 13 | 0 |
| 1905 .. .. | 3,301 | 1,670 | 17 | 0 |
| 1906 .. .. | 4,670 | 1,304 | 1 | 0 |
| 1907 .. .. | 1,783 | 611 | 6 | 0 |
| 1908 .. .. | 2,315 | 734 | 6 | 0 |
| 1909 .. .. | 1,760 | 782 | 10 | 0 |
| 1910 .. .. | 5,001 | 1,487 | 13 | 0 |
| 1911 .. .. | 1,287 | 578 | 14 | 0 |
| 1912 .. .. | 2,287 | 785 | 2 | 0 |
| 1913 .. .. | 1,083 | 231 | 4 | 6 |

The recorded total output by the Woah Hawp No. 1 Company to the end of December, 1913, was 10,454 oz. 2 dwt.

WOAH HAWP CENTRAL COMPANY.

(Pl. xxxi.)

The opening of this mine was the result of a plucky attempt on the part of a local company to test a portion of the Ballarat East belt in a systematic manner, and although not a success financially some good work was carried out. The claim was situated near the southern end of the Ballarat East line of shafts, south of and adjoining the Woah Hawp No. 1 Company (formerly British Queen). Sinking began in 1905, the shaft being 14 feet by 7 ft. 6 in., and divided into four compartments. Rapid progress was made to a depth of 200 feet, where cross-cuts were put in through soft strata containing many seams of pyrite; these beds were correlated with those in the mines to the north, but incorrectly owing to repetition by folding. The western cross-cut was driven 500 feet and the eastern 300 feet. Only one fault of the leather jacket type was intersected, and this was near the main anticline at 480 feet west of the shaft. A rise on this leather jacket connected to an air shaft about 80 feet deep. The quartz on this fault ranged 6 inches to 1 foot in width. At 60 feet west of the shaft what was regarded as the Western Indicator was driven on south for 250 feet, where a cross-cut east was put in 150 feet. Above the south drive several rises were put up and a little quartz was obtained. At 14 feet west of the shaft a drive of 50 feet was put in along veins pitching 15 degrees north and dipping east on what was known as Gay's line; at 53 feet east of the shaft what was regarded as the Indicator was driven on, and 60 feet east of this a mineral seam ½ inch wide was followed north and south. At 120 feet from the shaft a drive was put in south for 20 feet where a rise was put up 20 feet. At 160 feet from the shaft a rise was put up 12 feet.

Throughout the cross-cuts the dip of the strata is regular and normal. What appears to be the main anticline occurs at 480 feet west of the shaft. From this anticline up to a syncline at 270 feet from the shaft the strata dip east at 60 degrees to 65 degrees. Eastwards of the syncline the beds dip west at from 75 degrees to 85 degrees up to an anticline at 190 feet. From the anticline to the face of the east cross-cut, a distance of 490 feet, the dip ranges from 63 degrees to 80 degrees east.

During the few years the mine lasted about £6,000 was expended in useful prospecting in strata that had been proved to carry large bodies of quartz north and south, but none were located in this mine. The deepening of the shaft would be desirable, but there is no guide as to the depth where leather jackets with bodies of quartz would be found; there can be little doubt that such ore bodies occur, for in the Woah Hawp No. 1 mine to the north several were intersected.

### WOAH HAWP NO. 2 COMPANY.

(Pl. xxxii.)

This mine, which is situated on the south side of Magpie Gully, and on the northern slope of Tower Hill, is the most southerly of the mines surveyed.

Operations were carried on intermittently for a number of years by various parties, amongst which was the Llewellyn party, who obtained the following yields:—

| Year. | Quartz crushed. | Gold won. | |
|---|---|---|---|
| | tons. | oz. | dwt. |
| 1878 .. .. | 2,775 | 431 | 11 |
| 1879 .. .. | 141 | 30 | 3 |

The Woah Hawp No. 2 Company unwatered the mine and prospected above the 430-ft. (bottom) level on a mineral seam, obtaining during 1910 a few specimens of rough gold, but on the whole the results were disappointing. In 1915, aided by a Government grant, the old drive at the 220-ft. level was cleaned out, repaired and driven north beyond a cross-course up to which former parties had worked, but the quartz located was unprofitable, and in 1916 operations ceased.

The structure revealed in the 430-ft. cross-cut consists of east dipping strata to the west of the shaft for 200 feet. At 80 feet west a leather jacket fault was cut, and a drive north for 30 feet was put in where a rise of 39 feet struck 7 feet of mineralized quartz, on which drives north and south were put in. Near the leather jacket the strata were disturbed but with this exception the general dip of the beds was 82 degrees to 86 degrees east. On the west side of the shaft, there is a small syncline and 20 feet east of the shaft a small anticline, east of which the strata dip east to the face at 300 feet.

East of the shaft at the 220-ft. level extensive stopes connect to the surface, but whether the formations worked here were lodes of the leather jacket type or spurs could not be ascertained. The extensive nature of the workings, as shown on the plan, can be verified by the collapse of the surface over a large area.

## MISCELLANEOUS.

### TABLE SHOWING THE DEEPEST SHAFT AT BALLARAT.

EACH YEAR FROM 1854–1907.

| Year. | Quartz or Alluvial. | Depth in Feet. | Name of Company. | Locality. |
|---|---|---|---|---|
| 1854 | Alluvial | 140 | .. .. | Gravel Pits lead |
| 1855 | ,, | 148 | Gum Tree Flat | Ballarat East |
| 1856 | ,, | 250 | Bath's Party .. | Gravel Pits lead |
| 1857 | ,, | 265 | Great Eastern Co. | Golden Point Lead |
| 1858 | ,, | 365 | Cosmopolitan.. | ,, ,, |
| 1859 | ,, | 460 | Kohinoor .. | ,, ,, |
| 1860 | ,, | .. | .. | .. |
| 1861 | .. | .. | .. | .. |
| 1862 | .. | .. | .. | .. |
| 1863 | .. | .. | .. | .. |
| 1864 | Quartz | 370 | Band of Hope | Little Bendigo |
| | | 400 | Prince of Wales | Sebastopol |
| 1865 | ,, | 570 | Temperance Co. | Little Bendigo |
| | | | Sisters Co. .. | |
| 1866 | ,, | 520 | ,, ,, | ,, ,, |
| 1867 | ,, | 550 | Temperance Co. | .. |
| 1868 | ,, | 650 | ,, ,, | .. |
| 1869 | ,, | 650 | ,, ,, | .. |
| 1870 | ,, | 670 | .. | .. |
| 1871 | ,, | 670 | .. | .. |
| 1872 | ,, | 670 | .. | .. |
| 1873 | ,, | 750 | .. | .. |
| 1874 | ,, | 750 | .. | .. |
| 1875 | ,, | 808 | Hero | .. |
| 1876 | ,, | 850 | Temperance Co. | .. |
| 1877 | ,, | 900 | ,, ,, | .. |
| 1878 | ,, | 957 | ,, ,, | .. |
| 1879 | ,, | 955 | ,, ,, | .. |
| 1880 | ,, | 950 | ,, ,, | .. |
| 1881 | ,, | 950 | ,, ,, | .. |
| 1882 | ,, | 950 | ,, ,, | .. |
| 1883 | ,, | 950 | ,, ,, | .. |
| 1884 | ,, | 1,000 | Band and Albion Consols | Consols Line (No. 7 shaft) |
| 1885 | ,, | 1,115 | .. | .. |
| 1886 | ,, | 1,235 | .. | .. |
| 1887 | ,, | 1,415 | Band of Hope and Albion Consols | Consols Line of reef (No. 7 Shaft) |
| 1888 | ,, | 1,540 | Star of the East | Consols Line of Reef (No. 1 Shaft) |
| 1889 | ,, | 1,620 | Band of Hope and Albion Consols | Consols Line of Reef (No. 7 Shaft) |
| 1890 | ,, | 1730 | Star of the East | Consols Line of Reef (No. 1 Shaft) |
| 1891 | ,, | 1,730 | ,, ,, | Consols Line of Reef |
| 1892 | ,, | 1,820 | ,, ,, | Sebastopol |
| 1893 | ,, | 2,000 | South Star Co. | ,, |
| 1894 | ,, | 2,000 | ,, | ,, |
| | | | Star of the East No. 1 shaft | ,, |
| 1895 | ,, | 2,000 | ,, ,, | ,, |
| 1896 | ,, | 2,000 | ,, ,, | ,, |
| 1897 | ,, | 2,250 | South Star Co. and Star of the East Co., No. 1 shaft | Consols Line of Reef |
| 1898 | ,, | 2,521 | South Star Co. | .. |
| 1899 | ,, | .. | .. | .. |
| 1900 | ,, | .. | .. | .. |
| 1901 | ,, | 2,521 | South Star .. | Sebastopol |
| 1902 | ,, | 2,521 | .. | .. |
| 1903 | ,, | 2,521 | .. | .. |
| 1904 | ,, | 2,521 | .. | .. |
| 1905 | ,, | 2,600 | .. | Sinking |
| 1906 | ,, | 3,100 | .. | .. |
| 1907 | ,, | 3,170 | South Star .. | Sebastopol |

Star of the East sunk to 2,260 in January, 1903.

## Appendix: Laboratory Results.

### Clay briquetting tests.

Samples of clay were made into briquettes and burned at various temperatures with the results tabulated below:—

| Sample No. | Air Dried. | Muffle, 1,100°C. | Re-burned at 1450°C. |
|---|---|---|---|
| 234/07 | Shrinkage, 16 per cent. | 22 per cent. | 22 per cent. |
| | Brownish white | Light brown, inclined to splinter | Slaty grey |
| 235/07 | Shrinkage, 3 per cent. | 6 per cent. | 16 per cent. |
| | Yellowish white | Fine light red | Black, overburned |
| 236/07 | Shrinkage, 8 per cent. | 14·5 per cent. | 10 per cent. |
| | Light yellow | Fine dark red | Black, overburned, slightly vitrified |
| 52/08 | Shrinkage, nil | 4·5 per cent. | 9·5 per cent. |
| | Yellowish white | Yellowish white | Stone grey; hard, no fusion |

234/07. Decomposed dyke, Grey Horse line of reef, Little Bendigo. Fairly plastic, no grit. Shrinkage, very high. Possibly suitable for common stoneware.

235/07. Decomposed dyke, Watson's mullock heap, Yorkshire reef. Suitable for terra-cotta and tiles.

36/07. Decomposed dyke, dredged area, Little Bendigo Creek. No grit. Suitable for terra-cotta and tiles.

52/08. White clay. Plastic. Suitable for stoneware.

| Sample No. | Air Dried. | Muffle, 1,000°C. | Wind Furnace, 1,340°C. twice burned. | Wind Furnace, 1,340°C. once burned. |
|---|---|---|---|---|
| 363/12 | Shrinkage, 8 per cent. | 14·5 per cent. | 19 per cent. | 14·5 per cent. |
| | Brown | Fine red | Black, overburned, vitrified | Black, overburned, vitrified swollen |
| 364/12 | Shrinkage, 8 per cent. | 12·5 per cent. | 14·5 per cent. | 14·5 per cent. |
| | Light red | Terra-cotta red | Black, overburned, vitrified | Black, overburned, vitrified |
| 365/12 | Shrinkage, 1·5 per cent. | 1·5 per cent. | 11 per cent. | 8 per cent. |
| | Dull white | White, red stain | White, vitrified | White, vitrified |

363/12. Yellowish red coarse clay, with gritty patches, 30 chains south of Orphan Asylum, at 2 feet to 6 feet from surface. Suitable for superior brick or tile.

364/12. Red and grey ferruginous clay, with gritty patches from same locality. Suitable for superior brick or tile.

365/12. Decomposed granite, with coarse quartz grains, Treloar's shaft, near Warrenheip railway line. Contains solube sulphate of iron, which produces superficial colouring, but this disappears at the highest temperature. Shoud be suitable for stoneware.

### Spring water.

Sample of water from a salt spring, apparently associated with a decomposed basic dyke near Brown Hill Hote (see p. 56). The water was clear, but contained a very small amount of sediment which was filtered off before analysis The sediment consisted mainly of oxide of iron. The water tasted brackish and had no smell.

| | Grains per gallon. |
|---|---|
| $CaCO_3$ | 6·5 |
| $CaSO_4$ | 6·1 |
| $CaCl_2$ | 2·0 |
| $MgCl_2$ | 46·5 |
| $MgCO_3$ | nil |
| NaCl | 150·0 |
| $Na_2CO_3$ | nil |
| Inorganic solids | 211·1 |
| Volatile and organic | 29·0 |
| Total solids | 240·1 |

### Pyritic slate.

| No. | Gold per ton. | Silver per ton. |
|---|---|---|
| | oz. dwt. gr. | oz. dwt. gr. |
| 238/11 | 8 1 9 | 0 1 23 |
| 239/11 | 2 12 6 | 0 1 7 |
| 240/11 | 2 14 21 | 0 2 23 |

238/11. Slate, with abundant arsenical pyrites, Llanberris No. 1 mine, rise off east crosscut at north end of 800-feet level

239/11. Slate, with iron pyrites, Last Chance mine, rise from south drive off east crosscut between Russell's winze and Carney's rise, 800-feet level.

240/11. Slate, with arsenical pyrites, Last Chance mine, rise from south end of east crosscut, 800-feet level.

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Memoir No 13.

Plate No 1.

# GEOLOGICAL AND TOPOGRAPHICAL MAP OF WOOD'S POINT DISTRICT.

Scale – 40 Chains to One Inch.

H. Harman, Surveyor General
G. Dubois, Secretary for Mines
The Hon. A.A. Dobson, M.L.A. Minister of Mines

No 34 S.W. (New Series)

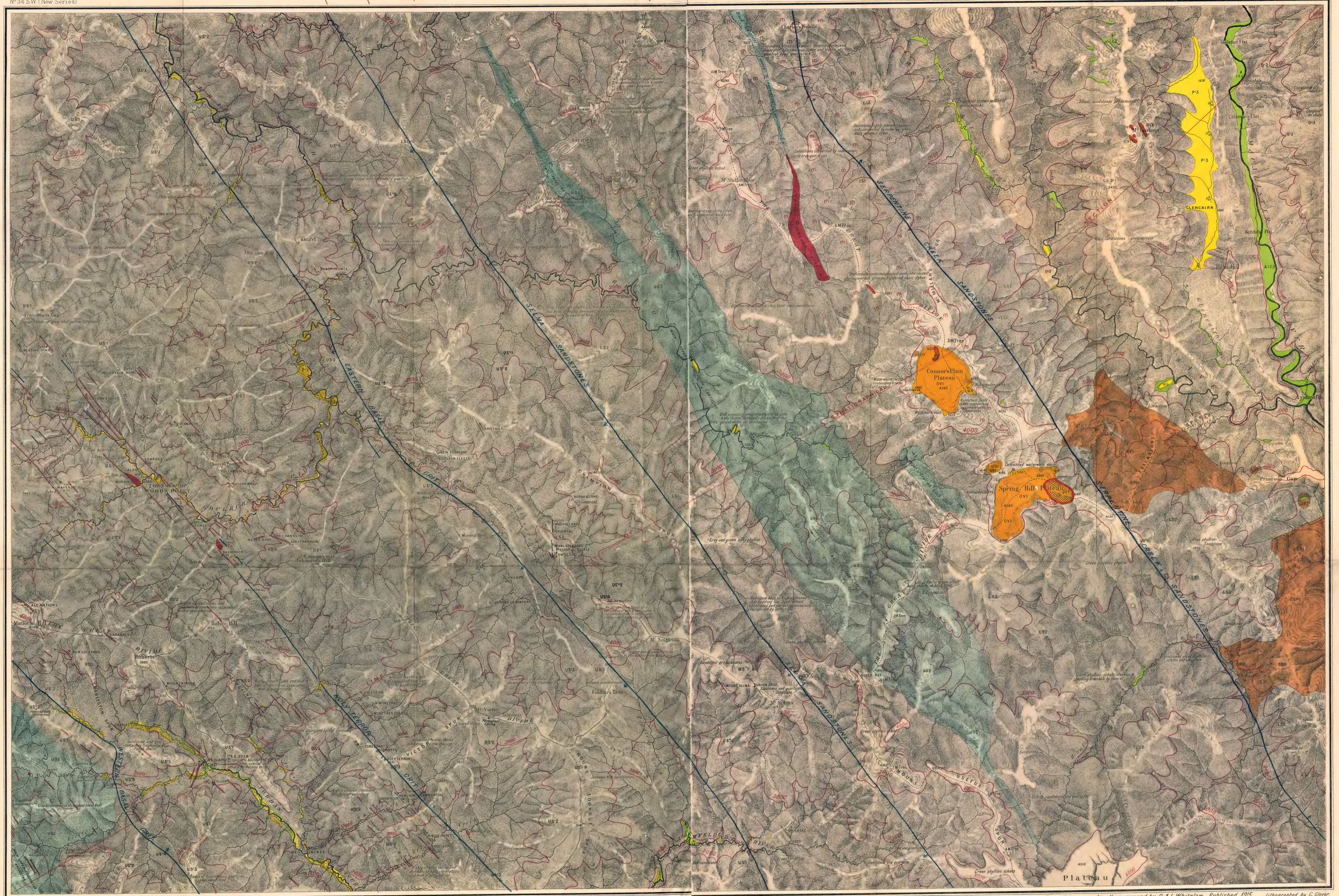
## SEDIMENTARY ROCKS

- RECENT — Fluviatile and swamp deposits on older rocks. — A1 Sand and Loam. A2 Clay. A3 Gravel and Conglomerate.
- POST PLIOCENE — River Terraces. — P1 Sand. P2 Clay. P3 Gravel and Conglomerate.
- MIOCENE — Sub-basaltic River gravels, Siliceous Rocks. — M1 Sand. M2 Clay. M3 Gravel and Conglomerate.
- UPPER DEVONIAN — Red and purple Shales Sandstones and Conglomerates. — D1 Sandstones. D2 Shales. D3 Conglomerates.
- UPPER SILURIAN (Walhalla Beds) — Conglomerates, Grits, Sandstones, Sandstones with shell casts, Shales and Slates. — US1 Sandstone and Quartzite. US2 Shales, Slates and Mudstone. US3 Conglomerate. US4 Limestone.
- UPPER SILURIAN (Jordan R. Beds) — 1 Yellow silky Mudstones with Pemenka &c. 2 Black Slates with Monograptus sp. — US1 Sandstone and Quartzite. US2 Shales, Slates and Mudstones.
- LOWER SILURIAN? (Mount Useful Beds) — Purple and green Schists, Phyllites and crumpled Slates. Lowermost Silurian or Uppermost Ordovician. — LS1 Sandstones and Quartzite. LS2 Slates, Phyllites and Schists. LS3 Conglomerates (Schistose).
- UPPER ORDOVICIAN (McEaston Beds) — Black Slates with subsidiary Fine-grained Sandstone. — UO1 Sandstones and Quartzite. UO2 Shales, Mudstones, Slates and Tuffs (?)

## IGNEOUS ROCKS

- OLDER BASALT (Miocene) — OV1 Basalt. OV2 Dolerite.
- SNOWY R. PORPHYRY (Lower Devonian) — S.P.1 Porphyry. S.P.2 Ash, Agglomerate and Tuffs.

Dioritic dyke · Basic dyke · Reefs · Reefs (auriferous) · Strike and Dip · Anticlines · Synclines · Fossiliferous zones · 4100 Aneroid Heights · Alluvial gold · Roads · Tracks · Tramways · Adits · Points of eruption · m m Metamorphosed rocks




Geologically and topographically surveyed by O.A.L. Whitelaw. Published 1915. Lithographed by C. Clover.

Plate No 1

# GEOLOGICAL MAP
# RAT GOLD FIELD

Scale of Chains.

## REFERENCE.

Recent Alluvial.

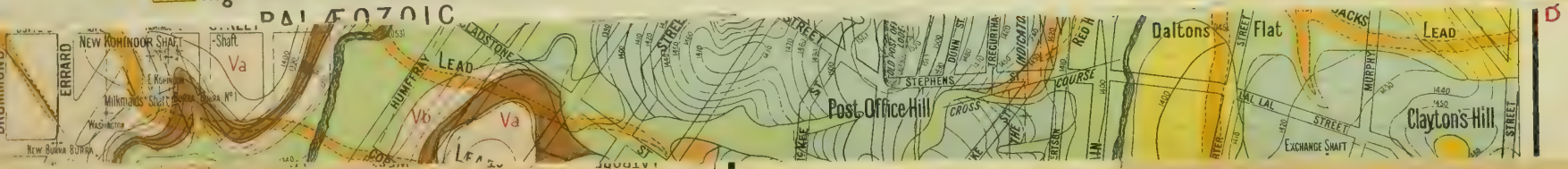
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ng
altic gravels &c — Newer Volcanic. { Va Vb Vc Vd } No 1 2 3 4 (LATEST / EARLIER) BASALT FLOW. NOT EXPOSED AT THE SURFACE

Basaltic clays, gravels & drift. — Sub-Basaltic clays, gravels & drift. { a DEEP LEADS. / b REEF WASH. } WHERE EXPOSED / WHERE PROVED UNDER NEWER DEPOSITS

High level Pre-Basaltic gravels.

PALÆOZOIC



# GEOLOGICAL MAP
# BALLARAT GOLD FIELD

Scale of Chains.

## REFERENCE.

Recent Alluvial.

TERTIARY.

Thin capping

Post-Basaltic gravels &c. Newer Volcanic. (LATEST BASALT FLOW / EARLIER) — NOT EXPOSED AT THE SURFACE

WHERE EXPOSED AT THE SURFACE: Intr-Basaltic clays, gravels & drift. Sub-Basaltic clays, gravels & drift. DEEP LEADS. (WHERE EXPOSED) a b; REEF WASH. (WHERE PROVED UNDER NEWER DEPOSITS) a b

High level Pre-Basaltic gravels.

PALÆOZOIC.

Ordovician shales, & fine grained-sandstones.

Anticlines where exposed / covered — Synclines where exposed / covered — Shafts, Alluvial, Ballarat Freehold - Quartz, KOHINOOR - Dykes — Contours of original surface 10 apart. The original course of Yarrowee Creek is shown.

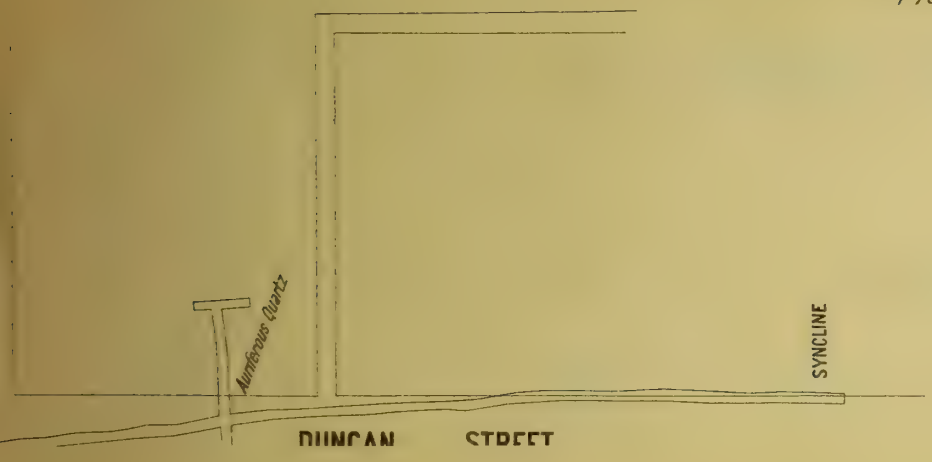
Section lines, Plate I — A-A, B-B, &c

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Geologically and topographically surveyed by W. Baragwanath, Senior Field Geologist, May, 1917.

Drawn for Plate-Mills by T.R. Dempsey.

Plate II



# BALLARAT NORTH PROS.TG Co.'S MINE

## BALLARAT

## UNDERGROUND WORKINGS

Scale of Feet

100 50 0 100 200

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director
W. Dickson, Secretary for Mines
The Hon. A.A. Billson M.L.A. Minister of Mines

W. Baragwanath Del.
December 1911.

## PLAN

N

Numerous Quartz

SYNCLINE

330 FT LEVEL

DUNCAN STREET

Engine and Boiler House

500 FT LEVEL

MAIN SHAFT

500 FT LEVEL

MAG. MER.

DRUMMOND STREET

FRANK STREET

Sill of Shaft 1467·30' above sea level

BASALT

CLAY

REFERENCE

Sandstone

Slate

Quartz

## TRANSVERSE SECTION

SHAFT

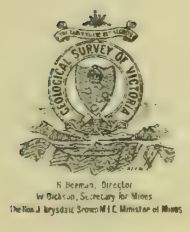
330 FT LEVEL

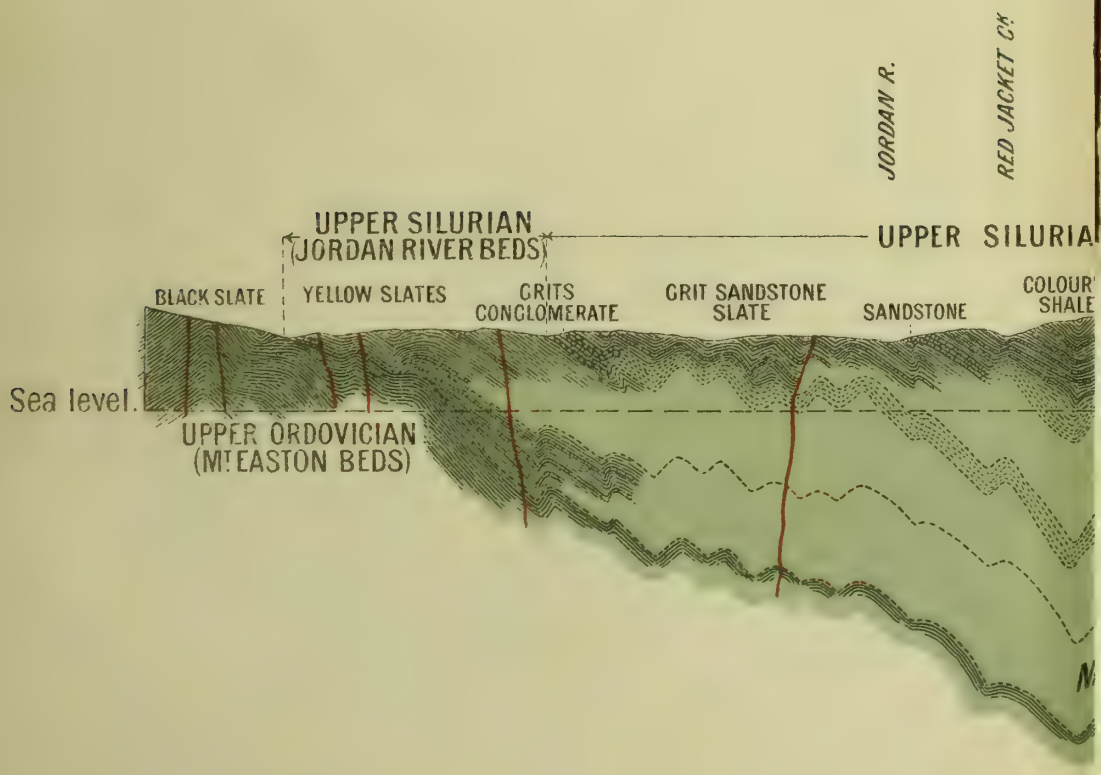
500 FT LEVEL

Probable Continuation

Memoir No. 13

# SECTIO



# SECTION SHOWING THE RELATIONS OF THE ROCKS ALONG THE LINE DRAWN ACROSS THE MAP OF THE WOOD'S POINT DISTRICT.

SCALES.- Horizontal & Vertical 1 Mile to 1 Inch.

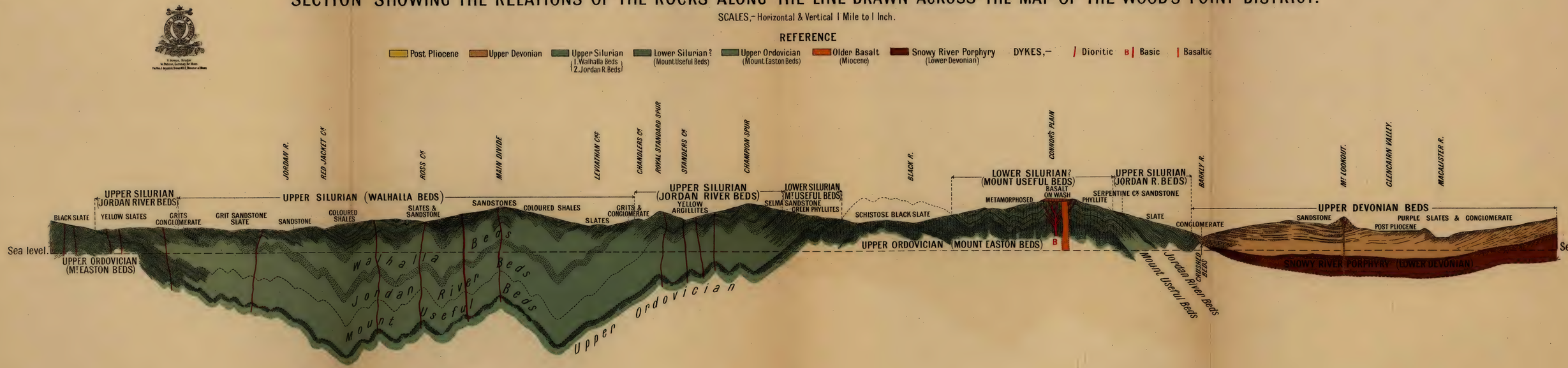
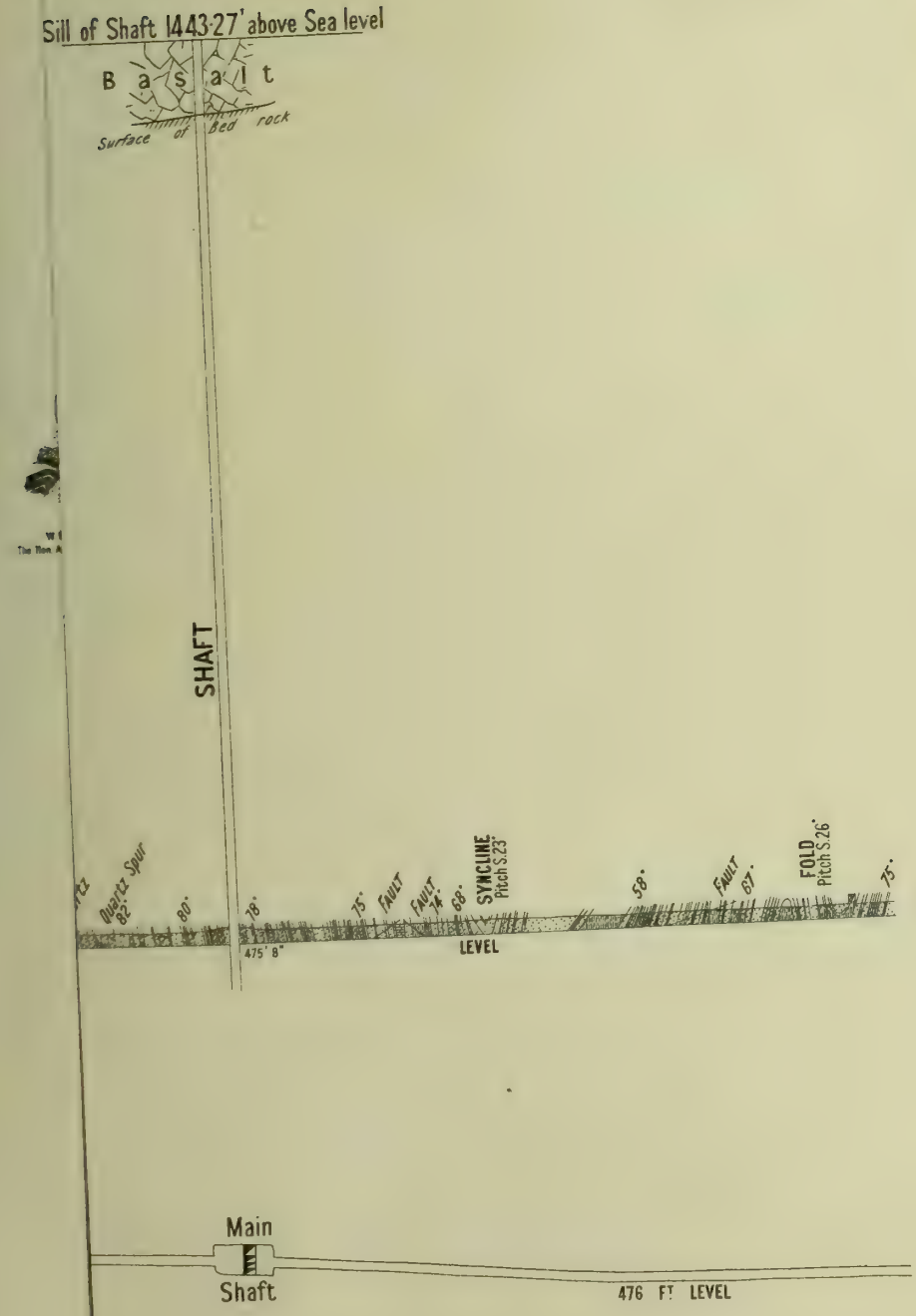


Plate III.


Sill of Shaft 1443·27' above Sea level
Basalt
Surface of Bed rock
SHAFT
Quartz Spur
82°
80°
78°
75°
FAULT
FAULT
14°
68°
SYNCLINE
Pitch S.23°
58°
FAULT
67°
FOLD
Pitch S.26°
75°
475' 8"
LEVEL
N
Main
Shaft
476 FT LEVEL

Memoir No. 14.

Plate III.

# BALLARAT CITY MINE

## BALLARAT

## UNDERGROUND WORKINGS

Scale of Feet

100 50 0 100 200

H. Herman, Director
W. Dickeson, Secretary for Mines.
The Hon. A. A. Billson M.L.A. Minister of Mines.

W. Baragwanath

December 1911.

REFERENCE

Sandstone

Slate

Quartz

## TRANSVERSE SECTION



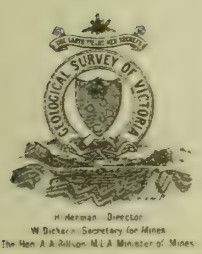

## PLAN



# NEW KOH-I-NOOR

# BALLARAT

## TRANSVERSE SECTIO

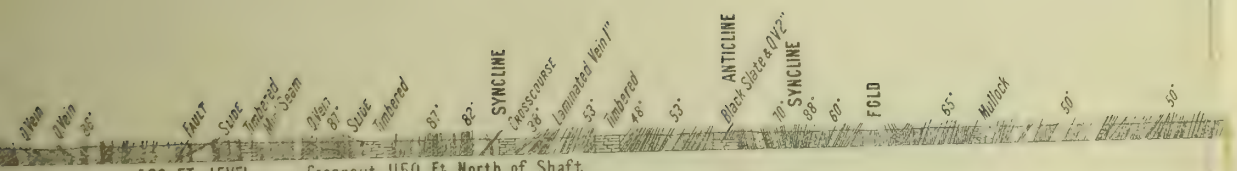



H. Herman Director
W. Dickason Secretary for Mines
The Hon. A. A. Billson M.L.A. Minister of Mines

Scale of Feet

100 50 0 100

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OCT 2 1923




580 FT LEVEL Crosscut 1150 Ft North of Shaft



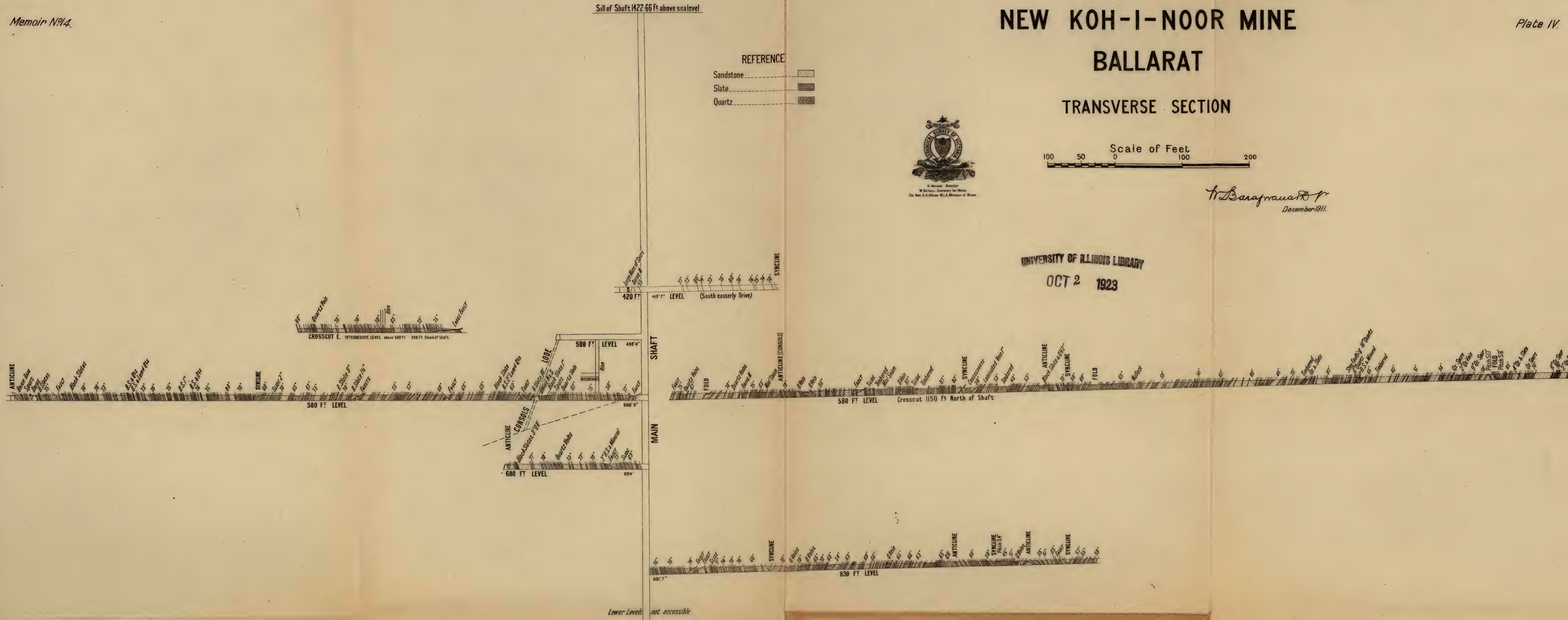

830 FT LEVEL

Memoir No 14.

# NEW KOH-I-NOOR MINE
# BALLARAT

## TRANSVERSE SECTION

Plate IV.




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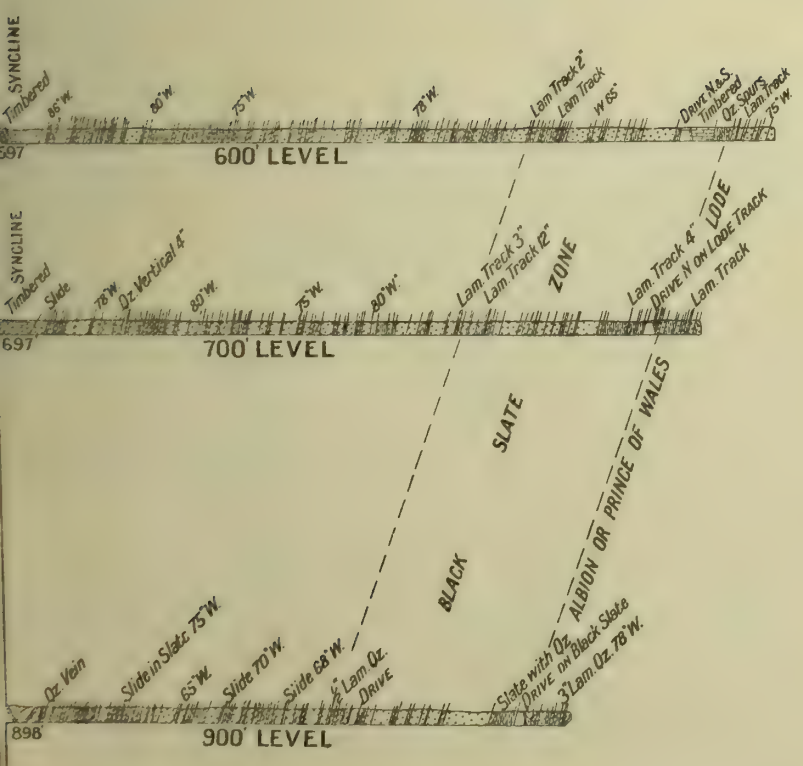
Plate XIII

above sea level

GEOLOGICAL SURVEY OF VICTORIA

H. Harman, Director
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines

# TRANSVERSE SECTION



# CENTRAL PLATEAU MINE

## No 2 SHAFT

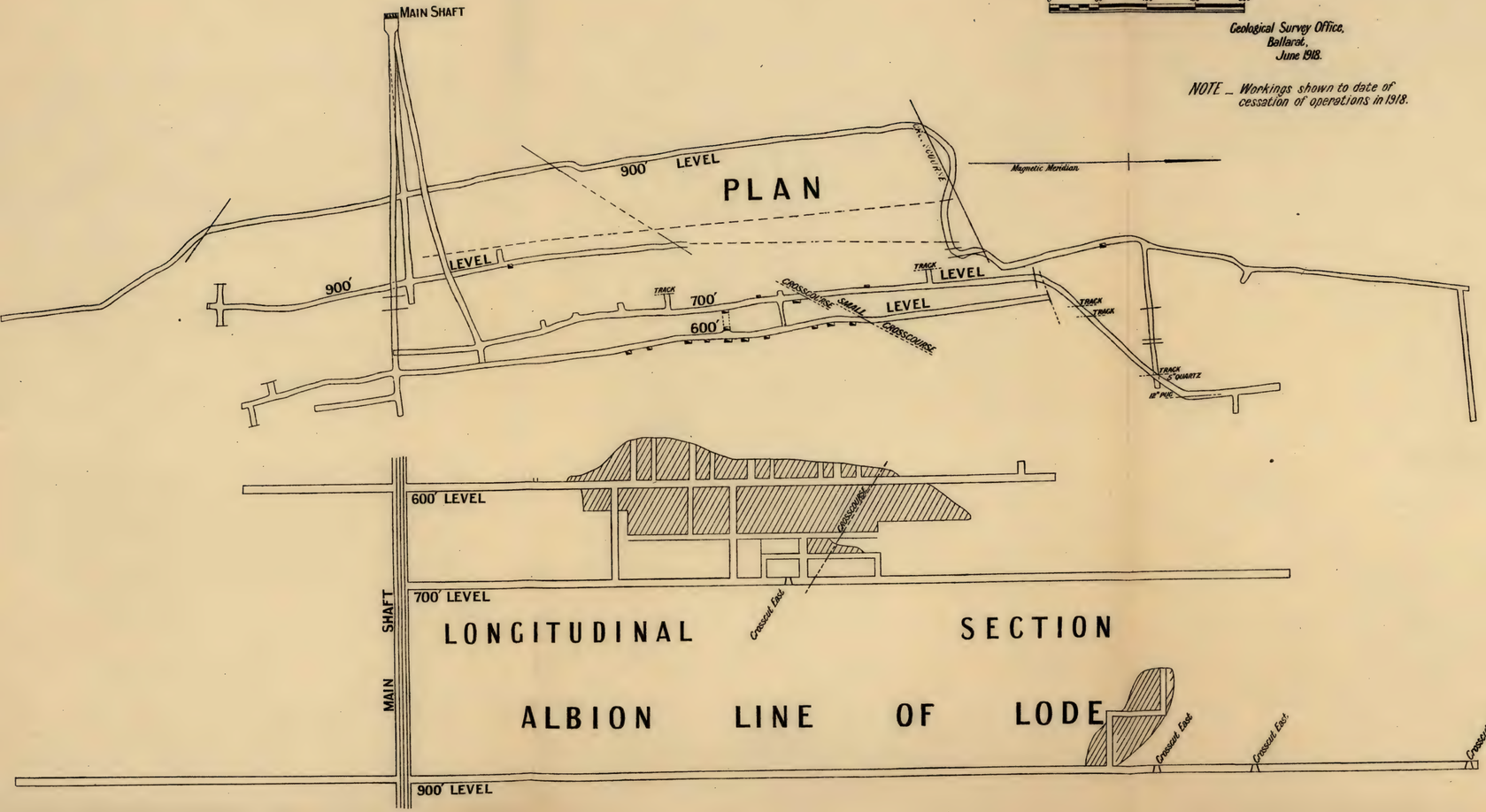
## SEBASTOPOL.

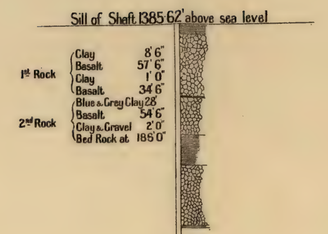
Scale of Feet

0 50 100 150 200

Geological Survey Office,
Ballarat,
June 1918.

NOTE _ Workings shown to date of cessation of operations in 1918.







# TRANSVERSE SECTION



Plate XIV



105.
of Mines.

shown to date of
of operations in 1915.




Plate XVI

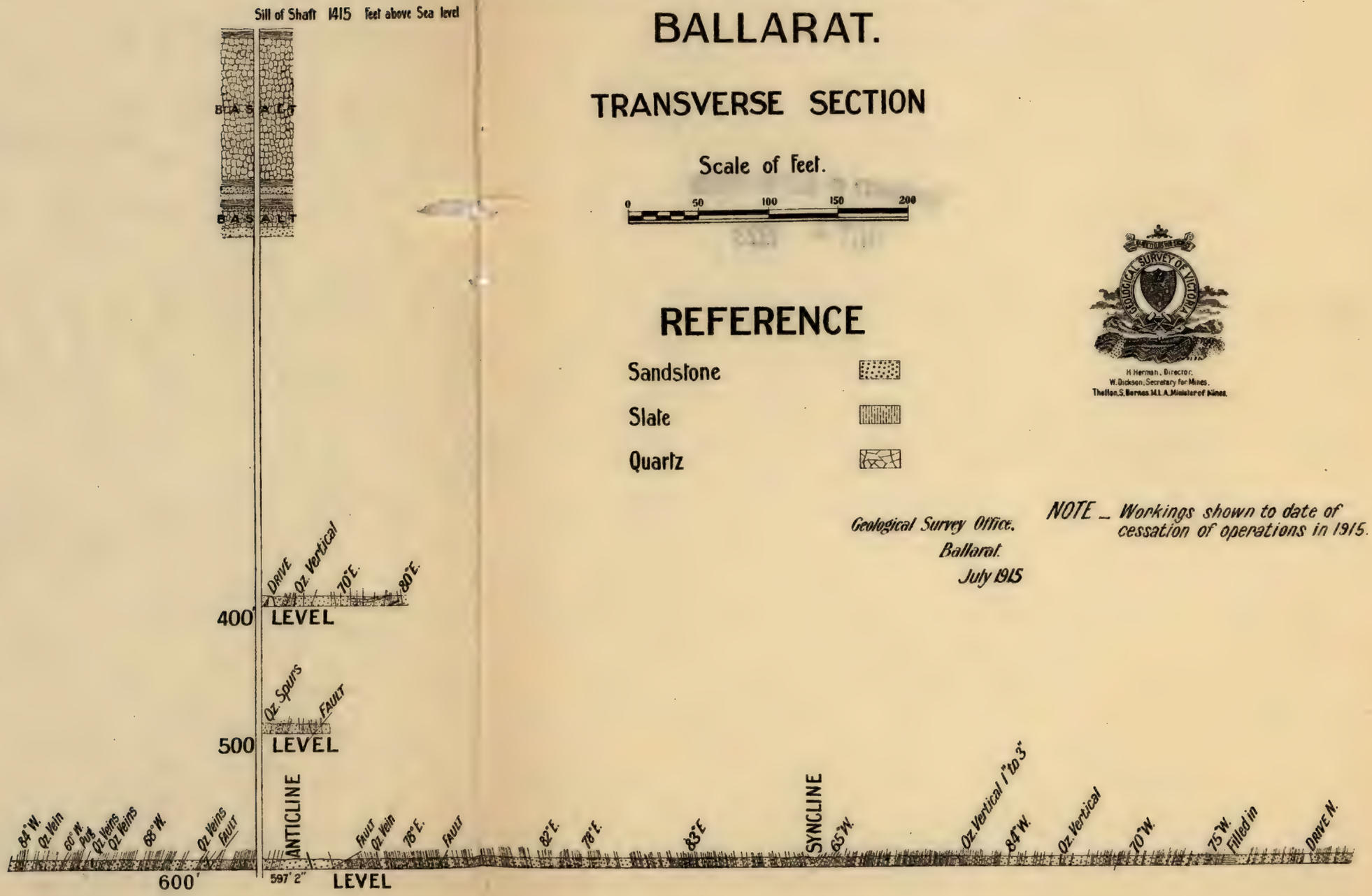
# CENTRAL PLATEAU EXTND MINE

## BALLARAT.

### TRANSVERSE SECTION

Scale of Feet.

0 50 100 150 200




### REFERENCE

Sandstone

Slate

Quartz

*Geological Survey Office.*
*Ballarat.*
*July 1915*

*NOTE — Workings shown to date of cessation of operations in 1915.*

H. Herman, Director.
W. Dickson, Secretary for Mines.
Thelion, S. Barnes M.L.A. Minister of Mines.

Plate XVI.


Sill of Shaft 1355·23' above sea level
REFERENCE
Sandstone
Slate
Quartz
201 FT. LEVEL
201' 3"
288 FT. LEVEL
288'2"
378 FT. LEVEL
378'5"
SHAFT
AXIS
SECTION
VERSE
SYNCLINAL
PHOENIX LINE
MAIN
ANTICLINAL
556 FT. LEVEL
555'11"
556 FT. LEVEL
LEVEL
645'5"
LEVEL
792'1"
Quartz Spurs
AXIS
Lam. Qz. Vein
890'11"
SYNCLINAL
ANTICLINE
SYNCLINE
990'9"

# SEBASTOPOL PLATEAU No1 MINE

## SEBASTOPOL, BALLARAT.

## TRANSVERSE SECTION

Scale of Feet.

100 50 0 100 200

NOTE _ Workings shown to date of cessation of operations in 1915.

Geological Survey Office.
Ballarat.
July 1915.

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OCT 2 1923

H. Harman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barrass M.L.A. Minister of Mines.

Sill of Shaft 1355·23' above sea level

REFERENCE
Sandstone
Slate
Quartz

201 FT. LEVEL

288 FT. LEVEL

378 FT. LEVEL

556 FT. LEVEL

645 FT. LEVEL

TRANSVERSE SECTION

SHAFT AXIS

MAIN ANTICLINAL

SYNCLINAL PHOENIX LINE

ANTICLINAL AXIS

SECTIONS OF CROSSCUTS OFF 800' LEVEL NORTH DRIVE

No6 No4 No3 No2 No1

800' LEVEL

900' LEVEL

1000' LEVEL

SECTIONS OF CROSSCUTS OFF 1000' LEVEL NORTH DRIVE

1400'N. 1220'N. 1150'N. 1080'N. 930'N. 770'N. 640'N. 520'N.

# VICTORIA UNITED MINE
## BALLARAT EAST
## TRANSVERSE SECTION

Scale of Feet.

0 50 100 150 200

Geological Survey Office
Ballarat
Dec. 1915.

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines.

NOTE _ Workings shown to date of cessation of operations in 1915

REFERENCE

Sandstone
Slate
Quartz

Memoir No. 14.

Plate VII.

OCT 2 1923
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# STAR OF THE EAST, BAND AND ALBION AND KOH-I-NOOR GROUP OF MINES

## BALLARAT

## PLAN OF UNDERGROUND WORKINGS

Scale of Feet
200 100 0 200 400

— REFERENCE —
Stoped Ground

NOTE.— Workings shown to date of cessation of operations as shown on separate mine plans.

December 1911

APPROXIMATE POSITION OF ALBION LODE
(At Surface of Bed-rock)

APPROXIMATE POSITION OF ALBION LODE
At 1250 Ft. Level

ALBION LODE WORKINGS

On Black Slate same Indicator as Guiding Star and Consols Lodes

GUIDING STAR LODE WORKINGS

CONSOLS LODE WORKINGS

Alluvial Workings

CROMWELL STREET
KENT
ALEXANDRA STREET
RUBICON STREET
ALFRED STREET
GOLDEN POINT CUTTER
HERTFORD
VERDON STREET
CLARKSON STREET
ALBERT STREET
BALA STREET
YARROWEE STREET
ORION
PICTON ST.
WILLIAM STREET
PLEASANT STREET
WARWICK ST.
RIPON STREET
GEORGE
LEITH
COBDEN
DARLING
TALBOT STREET
WINDERMERE
ASCOT ST.
SKIPTON
CAMPBELL
PARADE
YARROWEE CREEK
LATROBE
SEBASTOPOL
SURREY ST.
SOUTH
ESSEX ST.
URQUHART
INKERMANN ST.
SALISBURY AVE.
QUEEN VICTORIA AVE.
DRUMMOND
ERRARD
RAGLAN
LYONS
DAWSON
GOLDEN POINT CUTTER
MALAKOFF CUTTER
ALTERNATIVE

Mac Mer.

Plate VIII.

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# STAR OF THE EAST MINE
## SEBASTOPOL, BALLARAT.
### TRANSVERSE SECTION

Scale of Feet
100 50 0 100 200

NOTE – Workings shown to date of cessation of operations early in 1910.

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. Livingston M.L.A. Minister of Mines

REFERENCE
Sandstone
Slate
Quartz

H. Barafraua Del.
December 1911.

Clay
Basaltic Rock
Basaltic Rock
Clay and Drifts
Surface of Bed Rock

LODE
Reef faulted here
OF
LINE out
Rise on Lode from 1° to 3° East
ALBION Stoped (Indistinct Black Slate) and Auriferous
GRANITIC
AXIS
ANTICLINAL
MAIN
LODE
STAR
GUIDING
SHAFT
MAIN
APPROXIMATE POSITION OF WORKINGS

683 FT LEVEL
782 FT LEVEL
900 FT LEVEL
1000 FT LEVEL
1099 FT LEVEL
1200 FT LEVEL
1297 FT LEVEL
1395 FT LEVEL
1495 FT LEVEL
1694 FT LEVEL
1793 FT LEVEL
1892 FT LEVEL
2089 FT LEVEL
2185 FT LEVEL
2266 FT LEVEL

Probable Continuation
Probable Continuation
CROSSCUT TO W.L. SHAFT (See area for Scale)

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Plate X.

JIDI

SE

N O

Y

2000 Ft. LEVEL

Rise

Rise

2250 Ft. LEVEL

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# SOUTH STAR MINE

## GUIDING STAR AND CONSOLS LODES

## SEBASTOPOL, BALLARAT.

## PLAN OF UNDERGROUND WORKINGS

H. Herman - Director
W. Dickinson - Secretary for Mines.
The Hon. T. Livingston M.L.A. Minister of Mines.

Scale of Feet
100 50 0 100 200

NOTE _ Workings shown to date of cessation of operations early in 1908.

H. Beaufoy

December 1911

GRAY STREET

BALA ST

Lease Boundary

1400 FT. LEVEL
1010 FT. LEVEL
910 FT. LEVEL
870 FT. LEVEL
820 FT. LEVEL
720 FT. LEVEL
INTERMEDIATE

CUDDING STAR LODE WORKINGS

BEVERIN STREET

ALBERT STREET

N

MAG. MER.

100 FT. LEVEL
Rise
Blind Shaft
1100 FT. LEVEL

1400 FT. LEVEL
720 FT. LEVEL

South Star Main Shaft

3170'
2750'
2375'

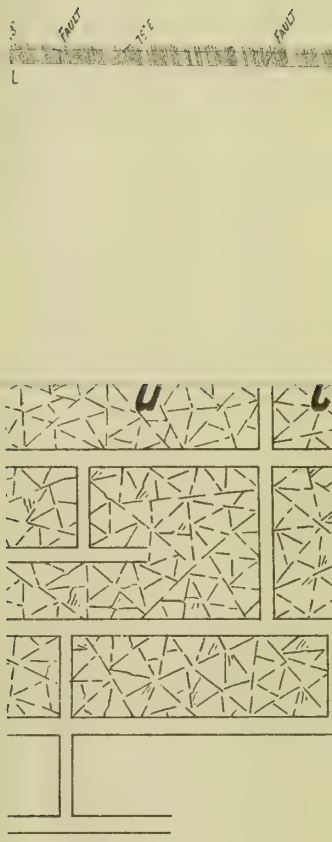
3100 FT. LEVEL
2750 FT. LEVEL
2500 FT. LEVEL
2250 FT. LEVEL
2000 FT. LEVEL

2250 FT. LEVEL
2375 FT. LEVEL
2500 FT. LEVEL
2000 FT. LEVEL
Rise
Rise

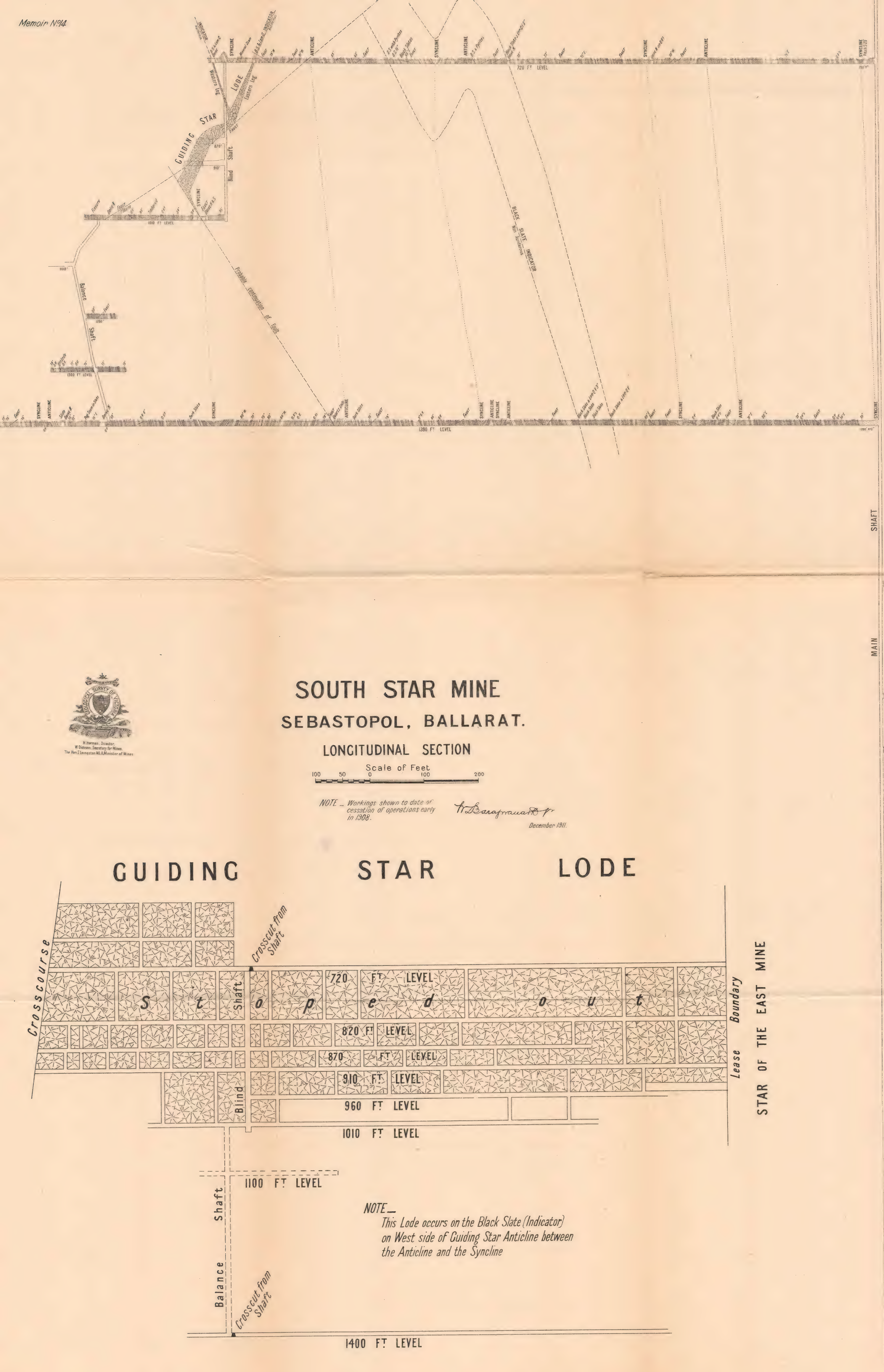
CONSOLS LODE WORKINGS

Lease Boundary

VICKERS STREET




or)
ween



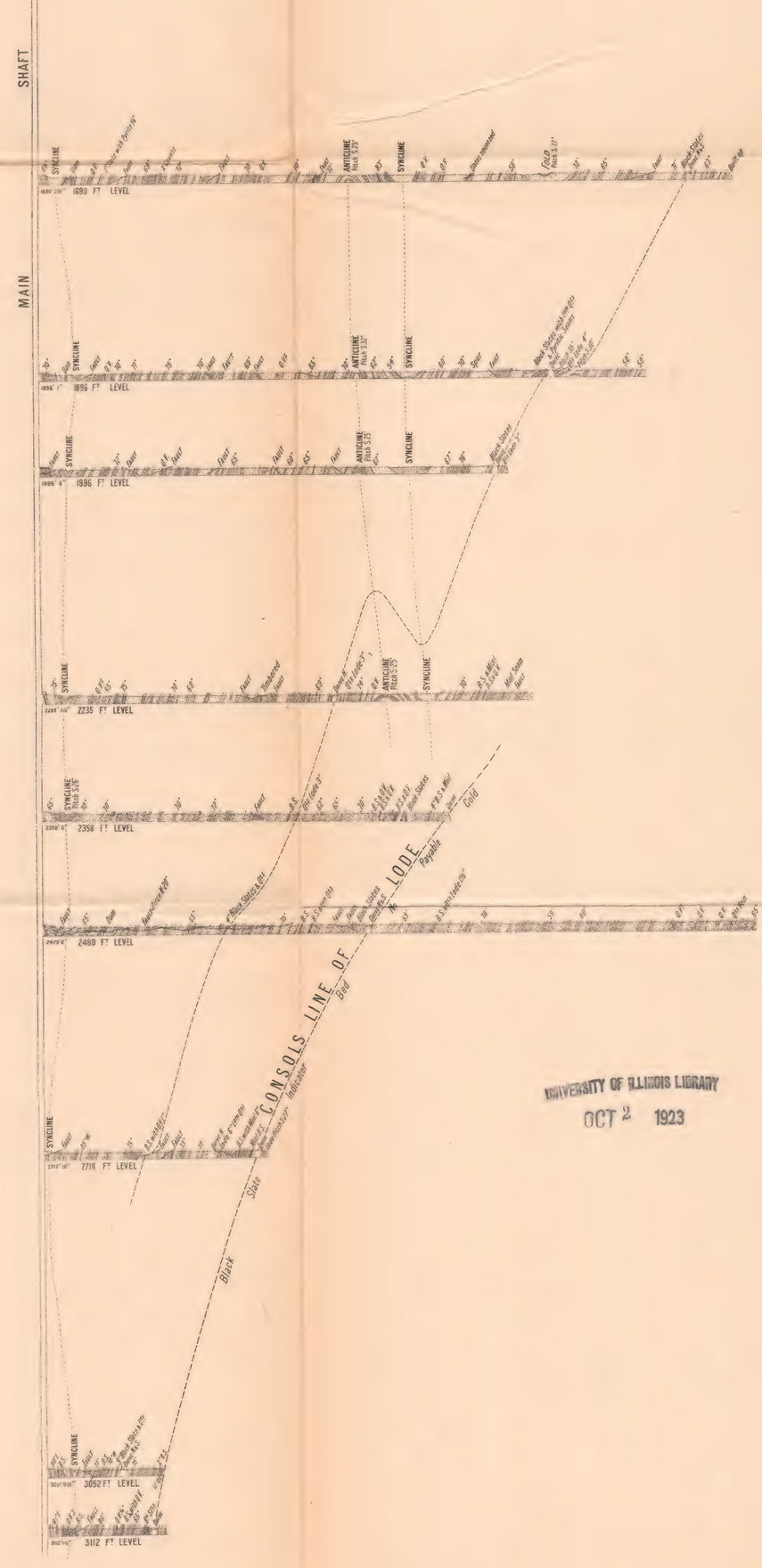




# TRANSVERSE SECTION

Scale of Feet

100 50 0 100 200




GEOLOGICAL SURVEY OF VICTORIA
H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. Z. Livingston M.L.A. Minister of Mines.

# SOUTH STAR MINE

## SEBASTOPOL, BALLARAT.

## LONGITUDINAL SECTION

Scale of Feet

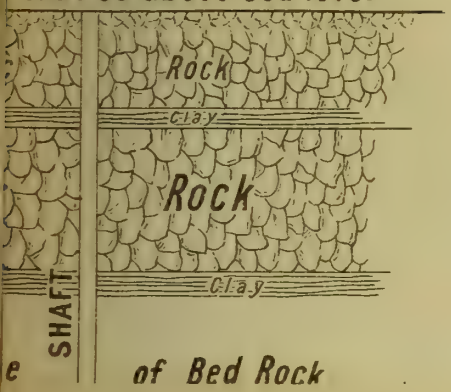
100 50 0 100 200

NOTE — Workings shown to date of cessation of operations early in 1908.

December 1911.

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1384·85' above sea level




e of Bed Rock

# STAR OF THE EAST MINE
(No 2 SHAFT)
GUIDING STAR LODE
SEBASTOPOL, BALLARAT.
LONGITUDINAL SECTION

Scale of Feet
100 50 0 100 200

NOTE — Workings shown to date of cessation of operations early in 1910.

H. Baragwanath Jr
December 1911.

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. F. Livingstone M.L.A. Minister of Mines.

NOTE —
This Lode occurs on the Black Slate (Indicator) on West side of Guiding Star Anticline between the Anticline and the Syncline

Sill of Shaft 1388·63' above sea level

Basaltic — Rock
Basaltic — Rock
Clay — Clay
Bed — Rock

Sill of Shaft 1384·85' above sea level

Basaltic — Rock
Basaltic — Rock

Surface of Bed Rock — Surface of Bed Rock

Stopes on Mineral Lode — Stopes on Quartz Reef

278 FT LEVEL
390 FT LEVEL
490 FT LEVEL

GUIDING STAR SHAFT
CROSSCOURSE
CROSSCOURSE

No 2 SHAFT

660 FT LEVEL
780 FT LEVEL
900 FT LEVEL
1100 FT LEVEL
1200 FT LEVEL
1300 FT LEVEL
1400 FT
1500'

GUIDING STAR LODE

900 FT LEVEL
1000 FT LEVEL
CROSSCOURSE

Stoped out

1000 FT LEVEL

South Star Mine

STAR OF THE EAST

CROSSCUT WEST

ALBION LODE

CROSSCUT FROM SHAFT
600 FT LEVEL
750 FT LEVEL
SLIDE
930 FT LEVEL
1000 FT LEVEL
CROSSCUT FROM SHAFT
CROSSCUT FROM SHAFT
1100 FT LEVEL
1230 FT LEVEL
1320 FT LEVEL
SLIDE
1410 FT LEVEL
CROSSCUT FROM SHAFT
1500 FT LEVEL

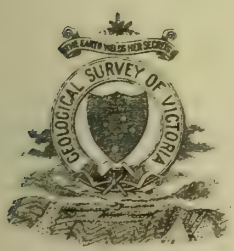
# STAR OF THE EAST MINE
(No 2 SHAFT) ALBION LODE
SEBASTOPOL, BALLARAT.
LONGITUDINAL SECTION

Scale of Feet
100 50 0 100 200

NOTE — Workings shown to date of cessation of operations early in 1910.

H. Baragwanath Jr
December 1911.

Plate XII




H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. A. Downward, M.L.A. Minister of Mines.

# CENTRAL PLATEAU MINE
## (N°1 SHAFT)
## SEBASTOPOL, BALLARAT.

Scale of Feet
100 50 0 100 200

NOTE... Workings shown to date of cessation of operations in 1908.

H. Brandrauat B.P.
December 1911.

GEOLOGICAL SURVEY OF VICTORIA
H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. A. Downward, M.L.A. Minister of Mines.

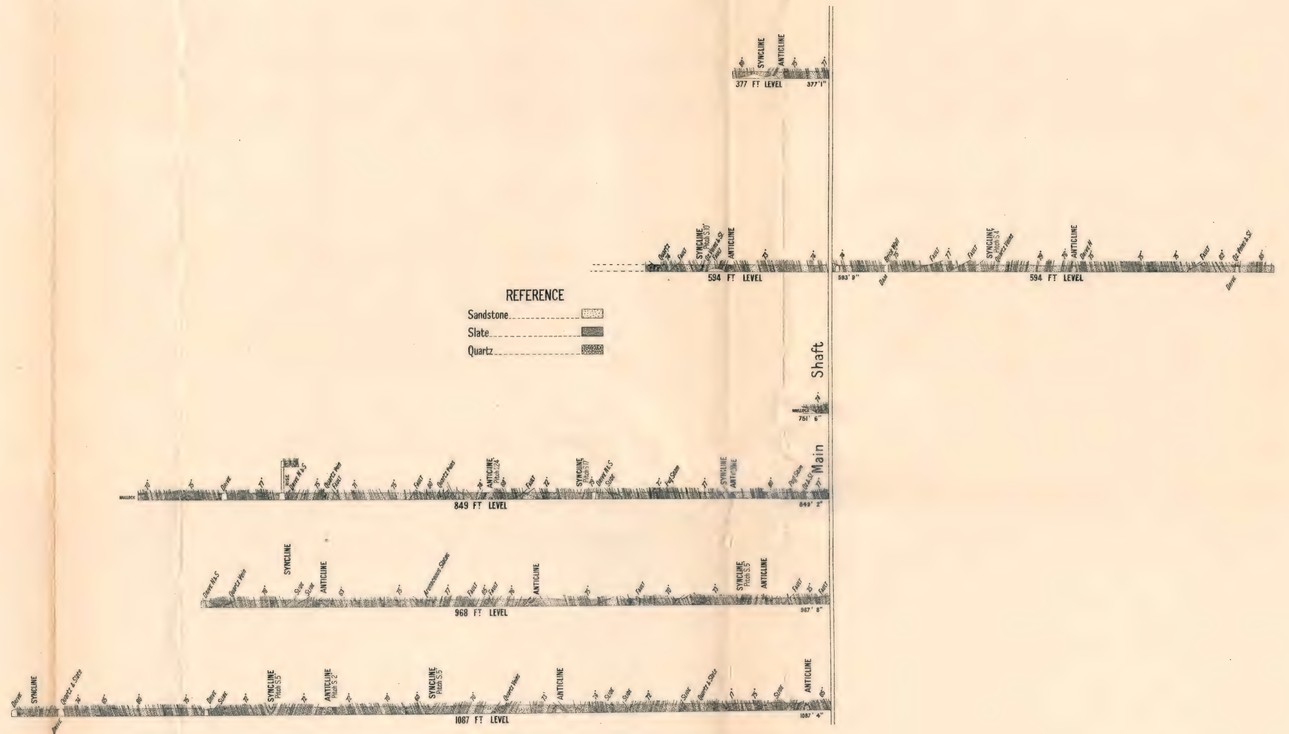
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## PLAN




NOTE... Owing to Workings being inaccessible survey taken from Manager's Plan.

## TRANSVERSE SECTION






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Section of 288 FT LEVEL

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# SEBASTOPOL PLATEAU N°1 MINE

## SEBASTOPOL, BALLARAT.

## PLAN

Scale of Feet
100 50 0 100 200

NOTE _ Workings shown to date of cessation of operations in 1915.

Geological Survey Office.
Ballarat
July 1915.

W. Baragwanath Dir

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes M.L.A. Minister of Mines.

MAG. MER.

1000 FT. LEVEL
900 FT. LEVEL
800 FT. LEVEL
645 FT. LEVEL
378 FT. LEVEL
288 FT. LEVEL

Dist.
FAULT
Lode
Rise
WC
Quartz
Roll
CR.
Rise 64
CROSSCUT from Rise
CROSSCOURSE
Reef 'B'
Reef 'A'
ANTICLINE AT 900'
SYNCLINE AT 900'
Winze
Face 556'
Face 378'
Main Shaft
556 Ft. LEVEL (FULL LINES)
201 Ft. LEVEL (BROKEN LINES)
Alluvial
Alluvial Workings
Small Gutter
Continuation of 288 FT. LEVEL

Granitic Dike
CROSSCOURSE
Track
BLACK SLATE
Displacement
LODE
BLACK SLATE & LAM. QZ.
BLACK SLATE
LAMINATED LODE 6"
Rise
PRINCE OF WALES OR ALBION LODE
Drive on Anticline
Rise
SYNCLINE
ANTICLINE
Drive on Black Slates
Black Slate Zone Dipping East.
900 Ft. LEVEL
SYNCLINE

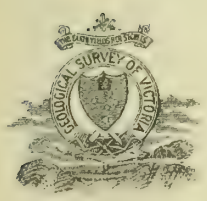
NOTE _ Drives in Broken Lines from Manager's Survey.

Plate XVIII

CTION
ED MINE
ST

200

August 191




H. Herman Director
W. Dickson, Secretary for Mines
The Hon. A. Downward, M.L.A. Minister of Mines

Sill of Shaft 1422·98' above sea level

REFERENCE

Sandstone

Slate

Quartz

# TRANSVERSE SECTION
# BRITANNIA UNITED MINE
# BALLARAT EAST

Scale of Feet

0 50 100 150 200

August 1913

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. A. Downward, M.L.A. Minister of Mines

TRANSVERSE SECTION

SHAFT

INDICATOR

THE

AXIS

MAIN

SYNCLINAL

ANTICLINAL

SYNCLINE

LEATHER JACKET

SLATE

BIG

FOOT

SLATES

DUCHESS

BLIND

FOUR

3" Qz. on Slate — Slate 75° E. — 83° E. — Big Ribbed Slate 87° — Qz. Vein 3"

350 FT LEVEL

85° E. — Barren Drive — 87° E. — Qz. Vein 2" 85° E. — Drive (with) — Fault — Timbered — Fault — Contorted Slate — Drive

400 FT LEVEL

Timbered — Main Drive — Fault — Broken Casing — Drive — Timbered

500 FT LEVEL

Timbered — 75° W. — Fault — 75° W. — 70° W. Rise

560 FT LEVEL

Fault — Fault — Drive — 85° E. — Drive — Qz. Vein 4" — 84° E.

630 FT LEVEL

Drive — 81° W. — Mullock — 85° E. — Black Slate 16" — 88° E. — Quartz Spurs, Pug, Slide (Pitch) — Qz. Vein 4" 88° W. — 85° E. — Leather Jacket — Timbered — Veins stopped — 81° E. — Fault — 85° E. — Drive — Qz. Vein 4" — 84° E.

720 FT LEVEL — 720' 5"

Fault — 87° W. — Magazine — Slide 74° W. — 85° E. — Qz. Vein 1" — 70° W. — Qz. Veins 71° W. — 85° E. — Drive N. — Qz. Vein 4" — Qz. Vein 4" — 86° E. — Slide — 70° W. — Fault 72 E.

720 FT LEVEL

71° W. — Lam. Qz. Vein 80° W. — Drive N. 12° — Ribbed Slate — Drive N. & S. — 85° E. — 83° E. — Rise — Pug Seam — 85° E. — Mullocked — Quartz — Timbered — Slate — Quartz 4" — 85° E. — 83° W. — 71° W. — Qz. Vein 4" — Mullocked — Drive N. 75° W. — Qz. Vein 4" — 85° E. — 86° E. — 73° E. — Crosscut on Angle

836 FT LEVEL — 836' 1"

Ribbed Slate — 75° W. — Rise — 71° W. — Mullocked — 86° E. — Mullocked — Drive N. — Qz. Spur 3" — Slates — Fault 86° E. — Vertical Strata — Qz. Spur 2" — Qz. Vein 1½" — 84° E. — 71° E. — Crosscut on Angle

940 FT LEVEL — 939' 8"

75° W. — Mineral Seam — Qz. Vein 4" — Qz. Vein — Vertical (Pitch) Qz. (Pitch) — 88° W. — W. 86° — Qz. Vein 3" — Vertical Strata — 5" Qz. Vein — 3" Qz. Vein — Big Slate in Syncline — Crosscut on Angle

1040 FT LEVEL — 1040'

Dip Drive & Rise Collapsed — 74° W. — Slide — Pitch — 80° W. — Qz. Vertical — 74° W. — Quartz vein stopped — Qz. Spur — Qz. Spur — Pitch — Pitch — Drive N. & S. — Fault — 85° E. — Qz. Vein — 65° W. — Slide

1179 FT LEVEL — 1179'

Sill of Shaft 1381·44 above sea level

# TRANSVERSE SECTION
# LAST CHANCE MINE
# BALLARAT EAST

Scale of Feet

0 50 100 150 200

August 1917

REFERENCE

Sandstone

Slate

Quartz

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director
W. Dickson, Secretary for Mines
The Hon. A. Downward, M.L.A. Minister of Mines

TRANSVERSE SECTION

433' 5"

494' 3½"

592' 7½"

689' 10"

789' 2"

888' 7½"

985' 9½"

1085' 4½"

1192'

No 7 LEVEL

No 6 LEVEL

No 5 LEVEL

No 4 LEVEL

No 3 LEVEL

No 2 LEVEL

No 1 LEVEL

JACKET AXIS

First Chance workings

ANTICLINAL

SLATES

INDICATOR

LEATHER AXIAL LINE

CHANCE

FIRST

THE BIG

SYNCLINAL AXIS

Approximate position of

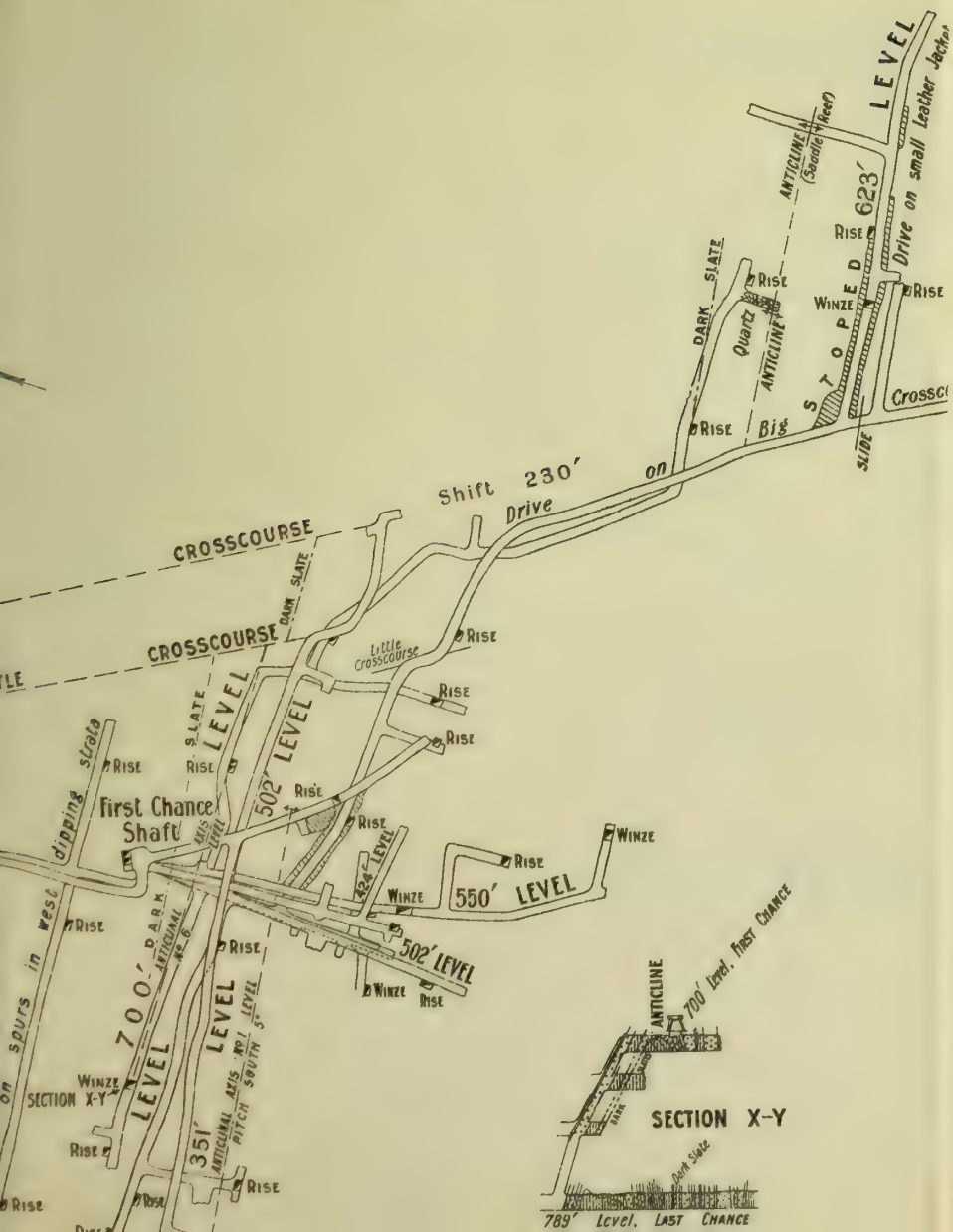
EASTERN SLATE AXIAL LINE

MAIN SHAFT

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# CHANCE MINES

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# FIRST CHANCE AND NORTH FIRST CHANCE MINES

## BALLARAT EAST.

Scale of Feet

0 50 100 150 200

August 1913.

NOTE Workings shown to date of cessation of operations in 1912.

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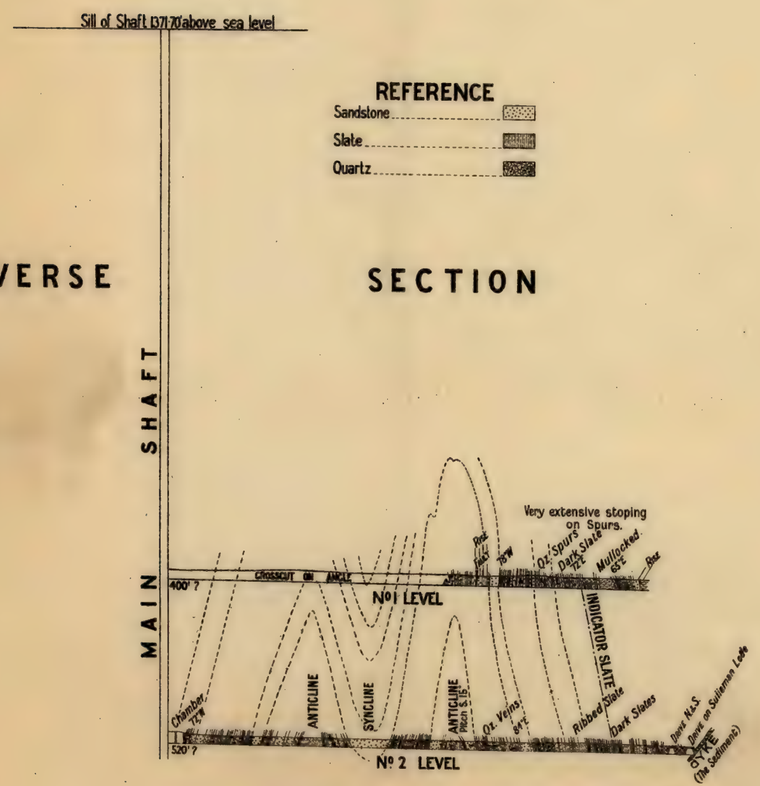
GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. A. Downward, M.L.A., Minister of Mines.




## FIRST CHANCE MINE

## NORTH FIRST CHANCE MINE



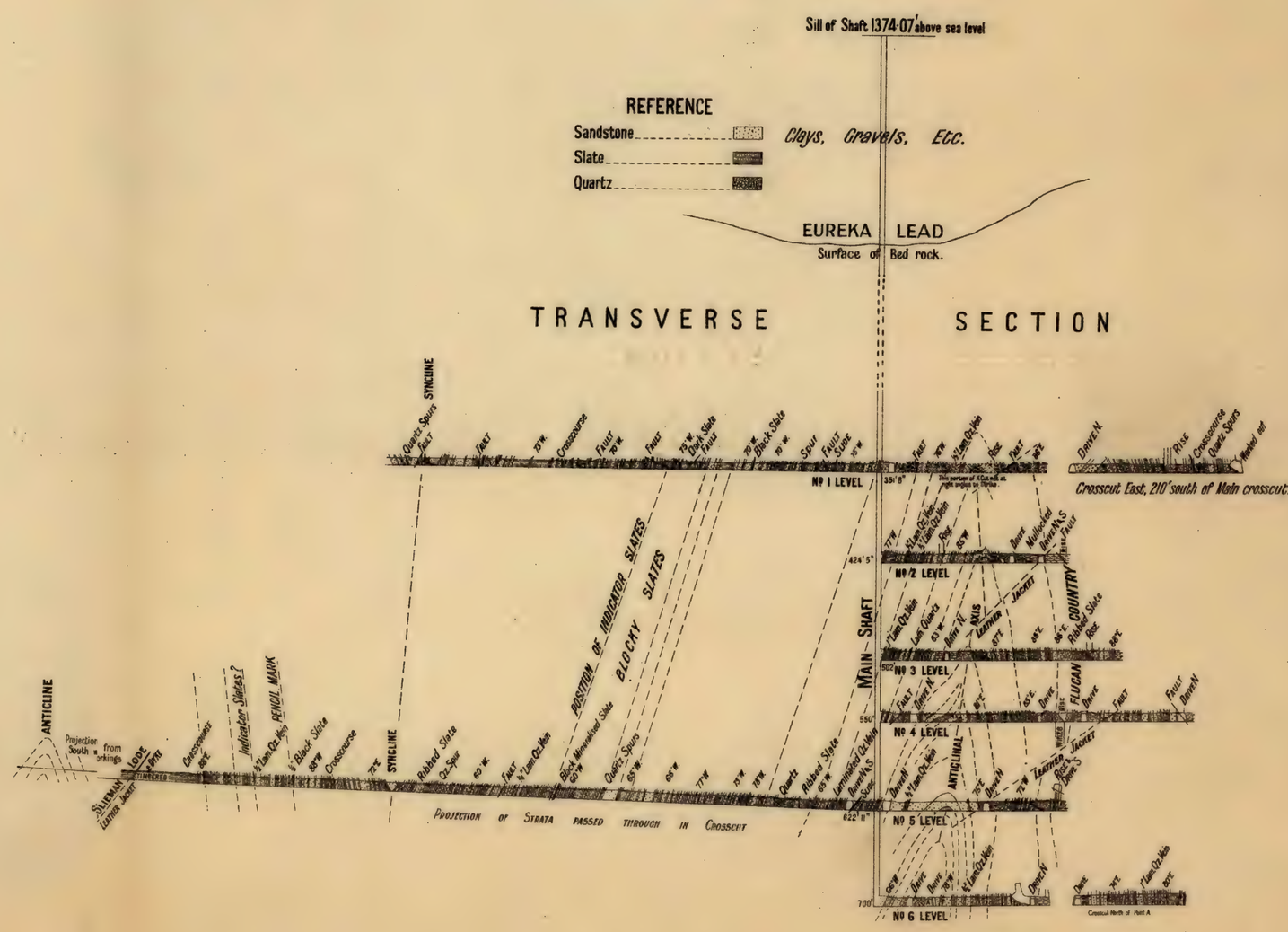



Plate XXI.

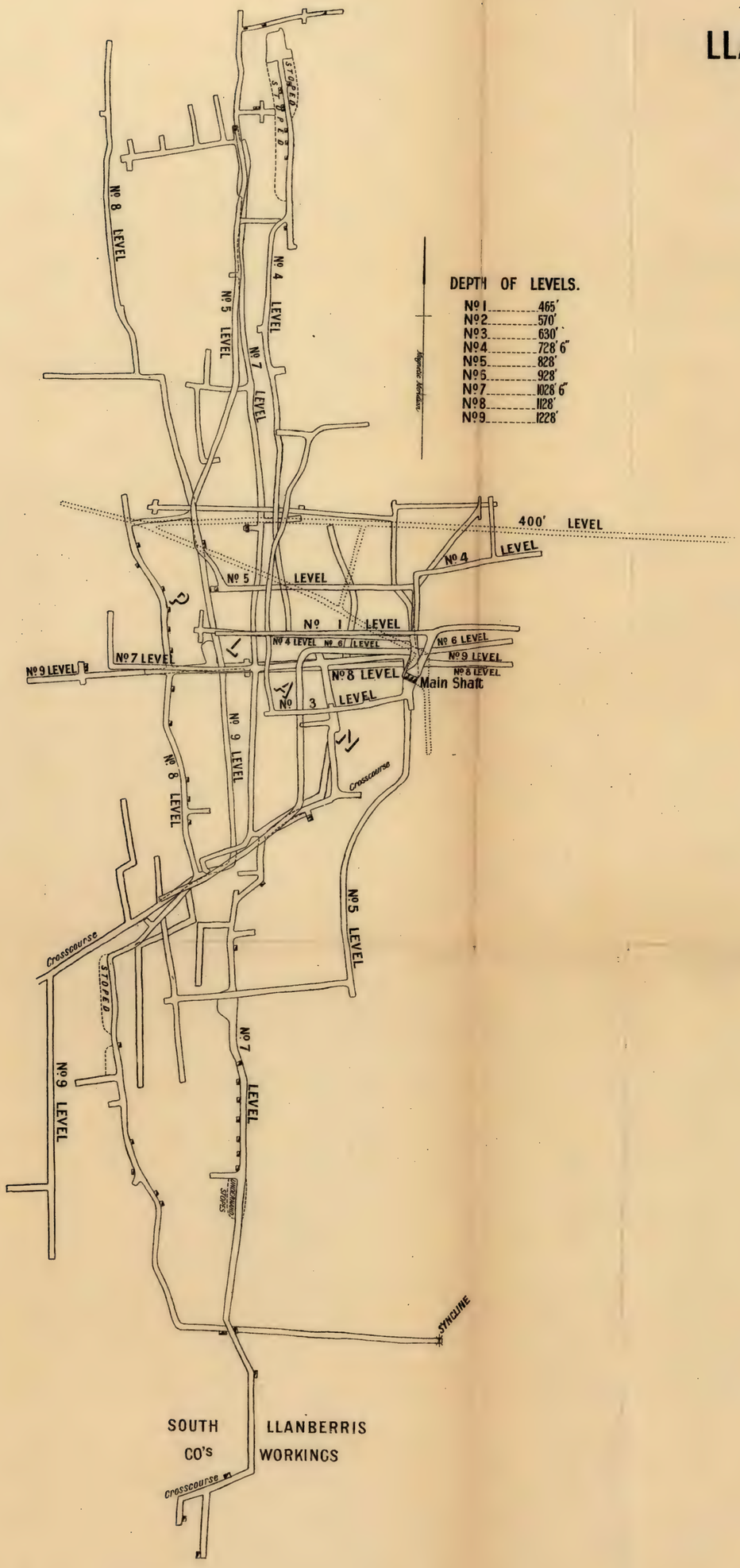

Sill of Shaft 1400·9' above sea level
CE
RSE
SECTION
Slate's Big Sandstone
Loam Qz. Vein
Drive N.
75° W.
75° E
Western Indicator
84° E
Big Slate
Drive N.S. Indicator Rise
Rise
Pencil Mark
Drive N.S. Black Slate ½"
Drive
FAULT
400' LEVEL
(140' North of Shaft)
Slate
78° W.
Qz. Shoots
Qz.
Drive N.
85° W.
85° W.
87° W.
Qz. Spur
465'
Nº 1 LEVEL
JACKET
LEATHER
Qz.
Drive (FILLED IN)
85° E
Nº 3 LEVEL
630'
SHAFT
THE INDICATOR SLATE
Qz. Vein
Drive N.
85° W.
85° W.
Qz. Rise
79° E.
85° E
Big Slate
82° E
Drive N. on Indicator
89° W.
Loam Qz. Vein
89° W.
728'6"
Nº 4 LEVEL
BIG INDICATOR MAIN
85° E
85° E
85° E
Nº 5 LEVEL
828'
Intersected Qz. Spur
FAULT
Slate Fault
85° E
Rise
FAULT
85° E

# LLANBERRIS Nº1 MINE

## BALLARAT EAST.

Scale of Feet

0 50 100 150 200




DEPTH OF LEVELS.

| | |
|---|---|
| Nº 1 | 465' |
| Nº 2 | 570' |
| Nº 3 | 630' |
| Nº 4 | 728' 6" |
| Nº 5 | 828' |
| Nº 6 | 928' |
| Nº 7 | 1028' 6" |
| Nº 8 | 1128' |
| Nº 9 | 1228' |

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines.

*Geological Survey Office, Ballarat.*

*W. Baragwanath Dir*

*NOTE _ Workings shown to date of cessation of operations in 1917.*

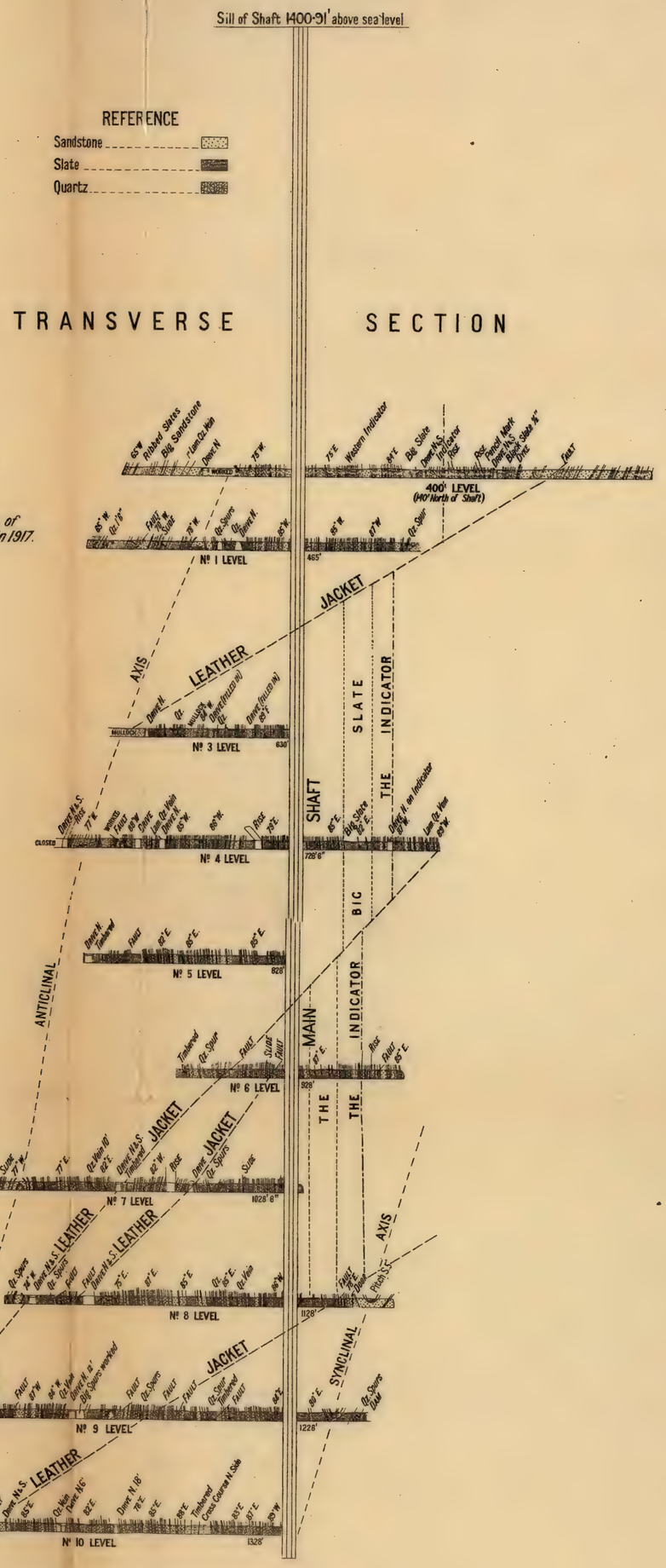
REFERENCE

Sandstone

Slate

Quartz

## TRANSVERSE SECTION



H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines.

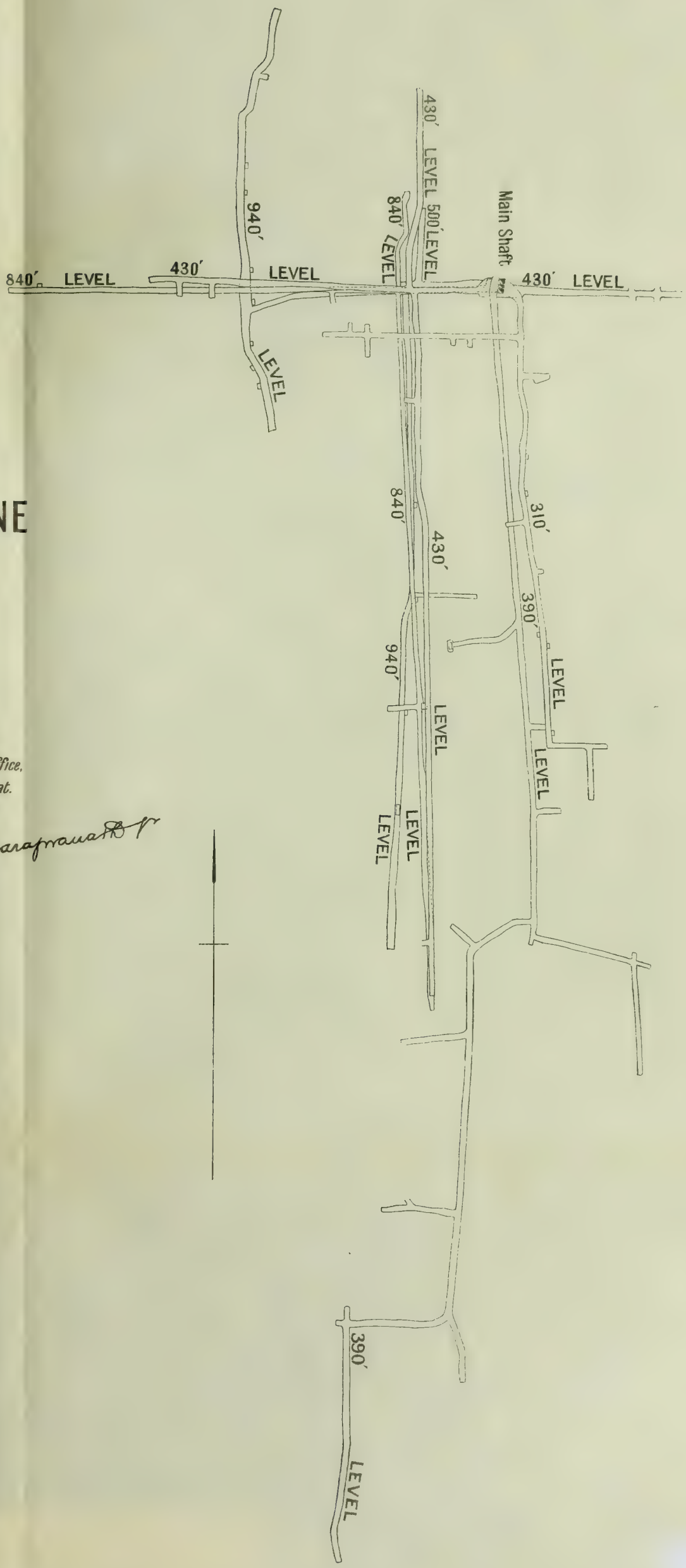
# LLANBERRIS No.2 MINE
## BALLARAT EAST.
## PLAN

Scale of Feet.

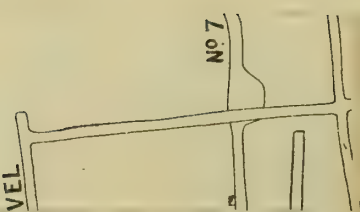
0 50 100 150 200

*Geological Survey Office,*
*Ballarat.*

NOTE – Workings shown to date of cessation of operations in 1910. The 1040' and 1148' levels were not accessible for survey.



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# TRANSVERSE SECTION
# LLANBERRIS Nº 2 MINE
## BALLARAT EAST

Scale of Feet

0 50 100 150 200

H Bauermann

Geological Survey Office,
Ballarat.

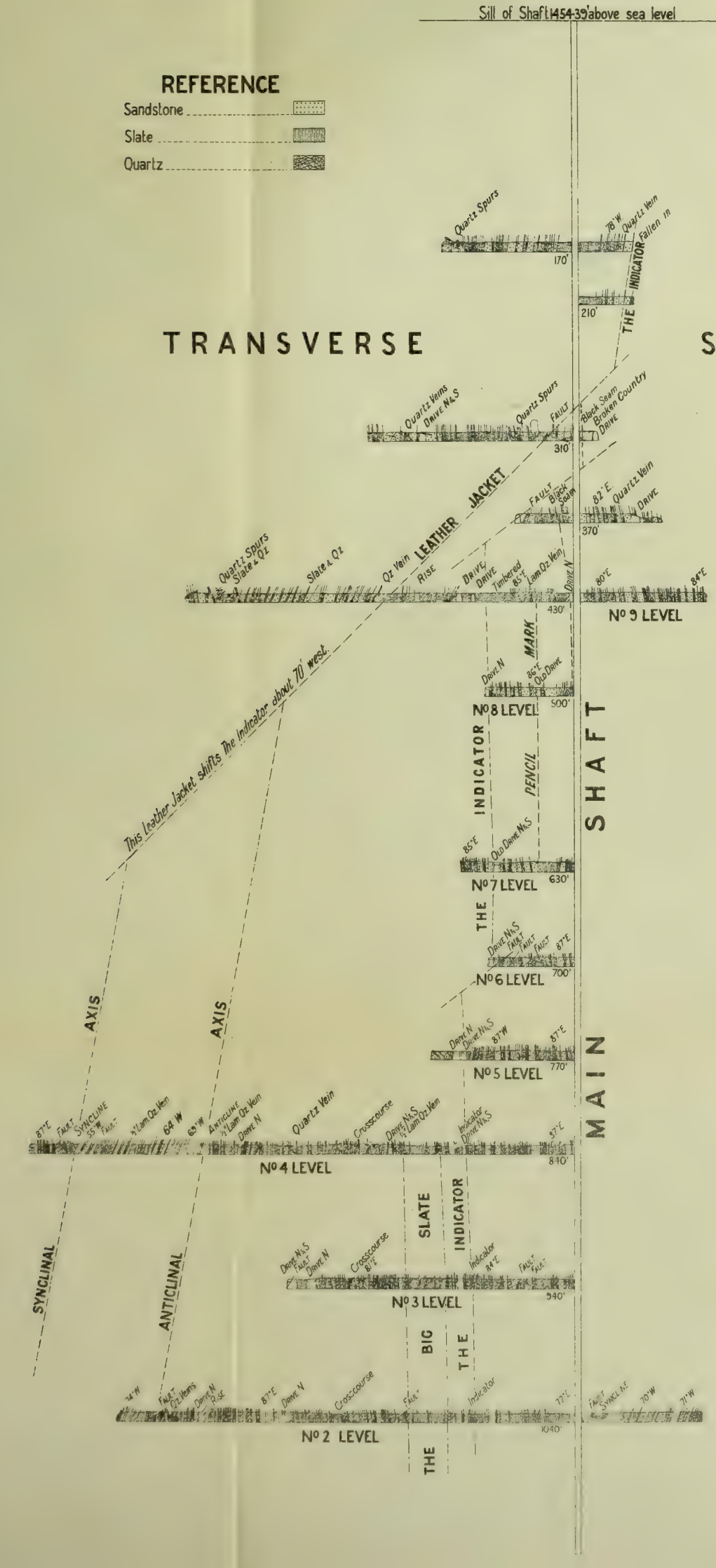
GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director
W. Dickson, Secretary for Mines
The Hon. S. Barnes M.L.A. Minister of Mines

NOTE _ Workings shown to date of cessation of operations in 1910.

## REFERENCE

Sandstone
Slate
Quartz



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0 50 100 150 200

H. Bauspraunt

Geological Survey Office, Ballarat.

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines.

Sill of Shaft 1504·31' above sea level

NOTE _ Workings shown to date of cessation of operations in 1915.

## REFERENCE

Sandstone

Slate

Quartz

# TRANSVERSE SECTION

ANTICLINE — SADDLE REEF — SYNCLINE — ANTICLINE

No 1 LEVEL 257'3"

No 2 LEVEL 336'9"

LEATHER JACKET — FAULT

No 3 LEVEL 435'9"

LEATHER JACKET

No 4 LEVEL 533'8"

No 5 LEVEL 602'9"

SLATE

No 6 LEVEL 697'8"

No 7 LEVEL 792'8"

SANDSTONE — SHAFT — JACKET

No 8 LEVEL 892'11"

BIG — INDICATOR

No 9 LEVEL 985'1"

LEATHER — MAIN

No 10 LEVEL 1083'5"

BIG — JACKET — THE

No 11 LEVEL 1182'

LEATHER — JACKET — THE

No 12 LEVEL 1278'9"

LEATHER — THE — SYNCLINE

No 13 LEVEL 1388'5½"

THE — LEATHER JACKET

No 14 LEVEL 1489'11¼"

Qz. Spurs — Fault — Qz. Vein — Qz. Vein Drive N. — Crosscourse

No 15 LEVEL 1589'10¾"

Memoir No 14

Plate XXIV.

# TRANSVERSE SECTION
# NORTH NORMANBY MINE
# BALLARAT EAST

Scale of Feet

0 50 100 150 200

H Brazenor

Geological Survey Office,
Ballarat.

## REFERENCE

Sandstone

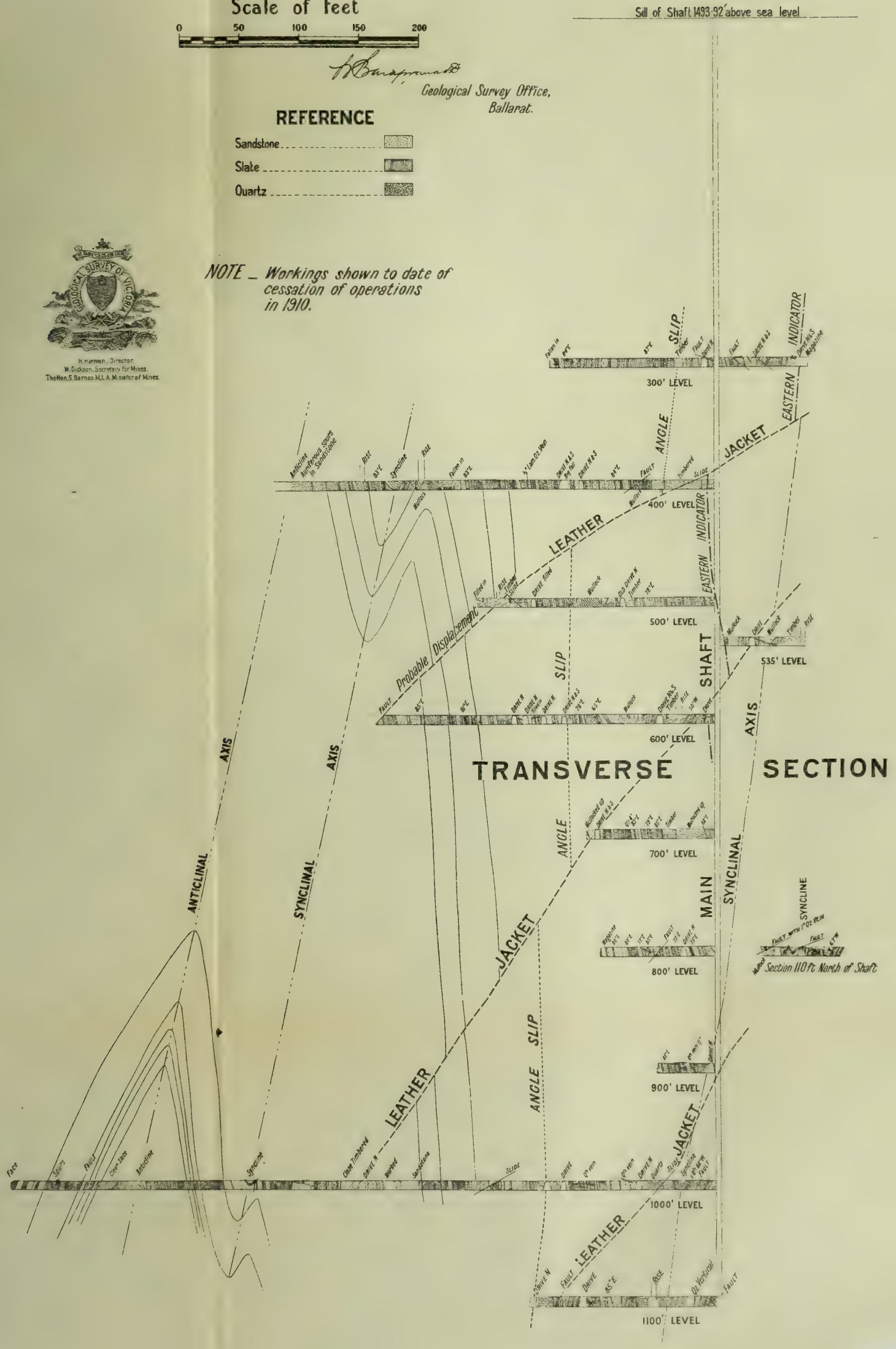
Slate

Quartz

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes M.L.A. Minister of Mines.

NOTE _ Workings shown to date of cessation of operations in 1910.



# TRANSVERSE SECTION
# NORTH WOAH HAWP MINE
# BALLARAT EAST

**REFERENCE**

Sandstone
Slate
Quartz

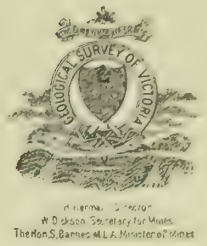
Scale of Feet

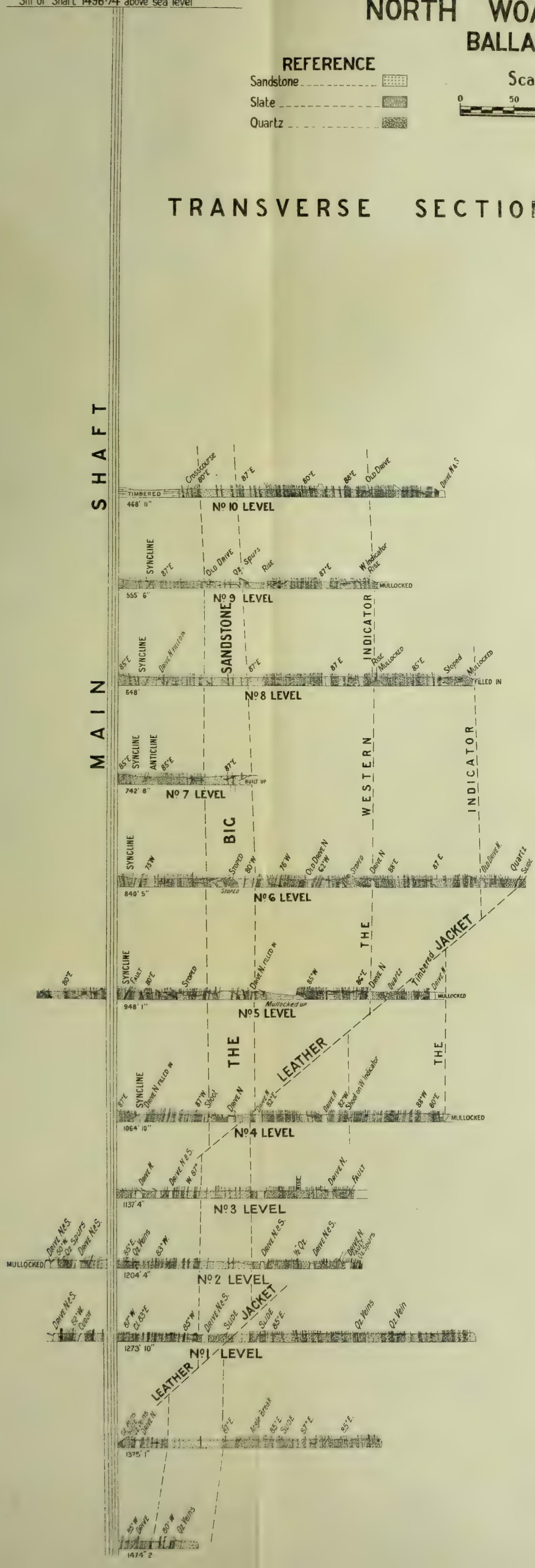
0 50 100 150 200

H Brassington
Geological Survey Office,
Ballarat.

## TRANSVERSE SECTION

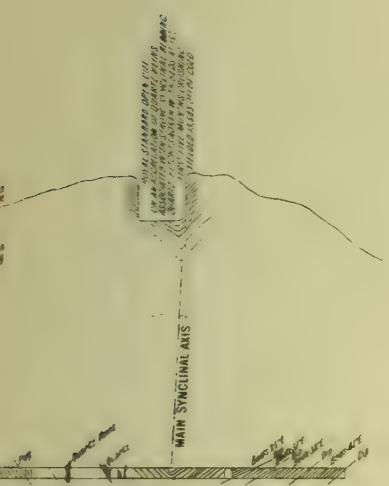
NOTE _ Workings shown to 1916.



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*Plate Nº XXVI.*




## N OF Nº14 ADIT

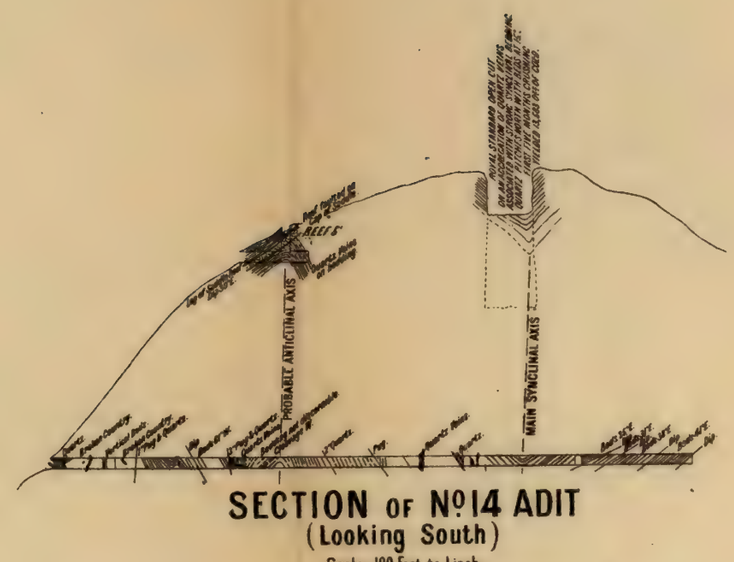
king South)

e,-100 Feet to Inch.

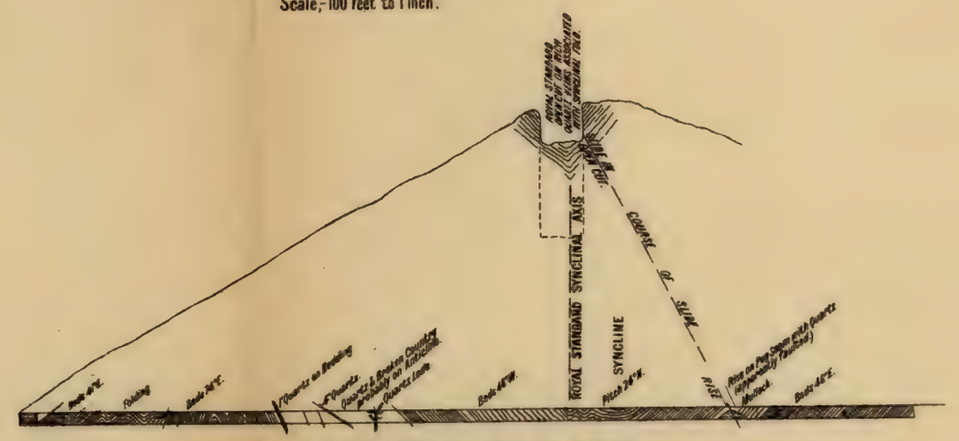



Nº 2 LEVEL




## SECTION OF No14 ADIT
(Looking South)
Scale,-100 Feet to 1 inch.




## SECTION OF No13 ADIT
(Looking South)
Scale,-100 Feet to 1 inch.

## SECTION IN No19 X CUT SHEWING SADDLE REEF VEINS FORMED ON ANTICLINE IN BLACK SLATE COUNTRY
Scale,-30 Feet to 1 inch

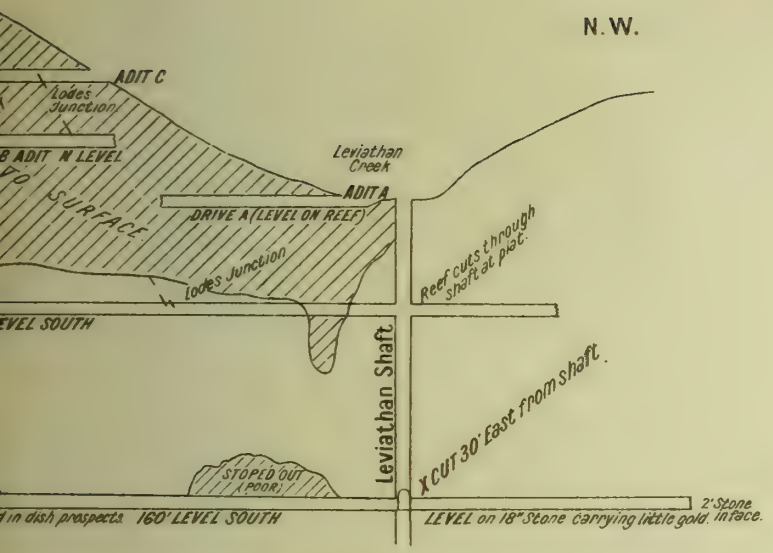



GEOLOGICAL SURVEY OF VICTORIA
H. Herman, Director
W. Dickson, Secretary for Mines
The Hon. J. Bryndale Brown M.L.C. Minister of Mines

# ROYAL STANDARD G. M. Co
## STANDER'S CREEK, WOODS POINT.
## Underground Workings

Scale,-200 Feet to 1 inch.

SECTION




HAFT WORKINGS ARE FROM INFORMATION ONLY

# LEVIATHAN C. M. Cº

## LEVIATHAN CREEK, WOODS POINT.

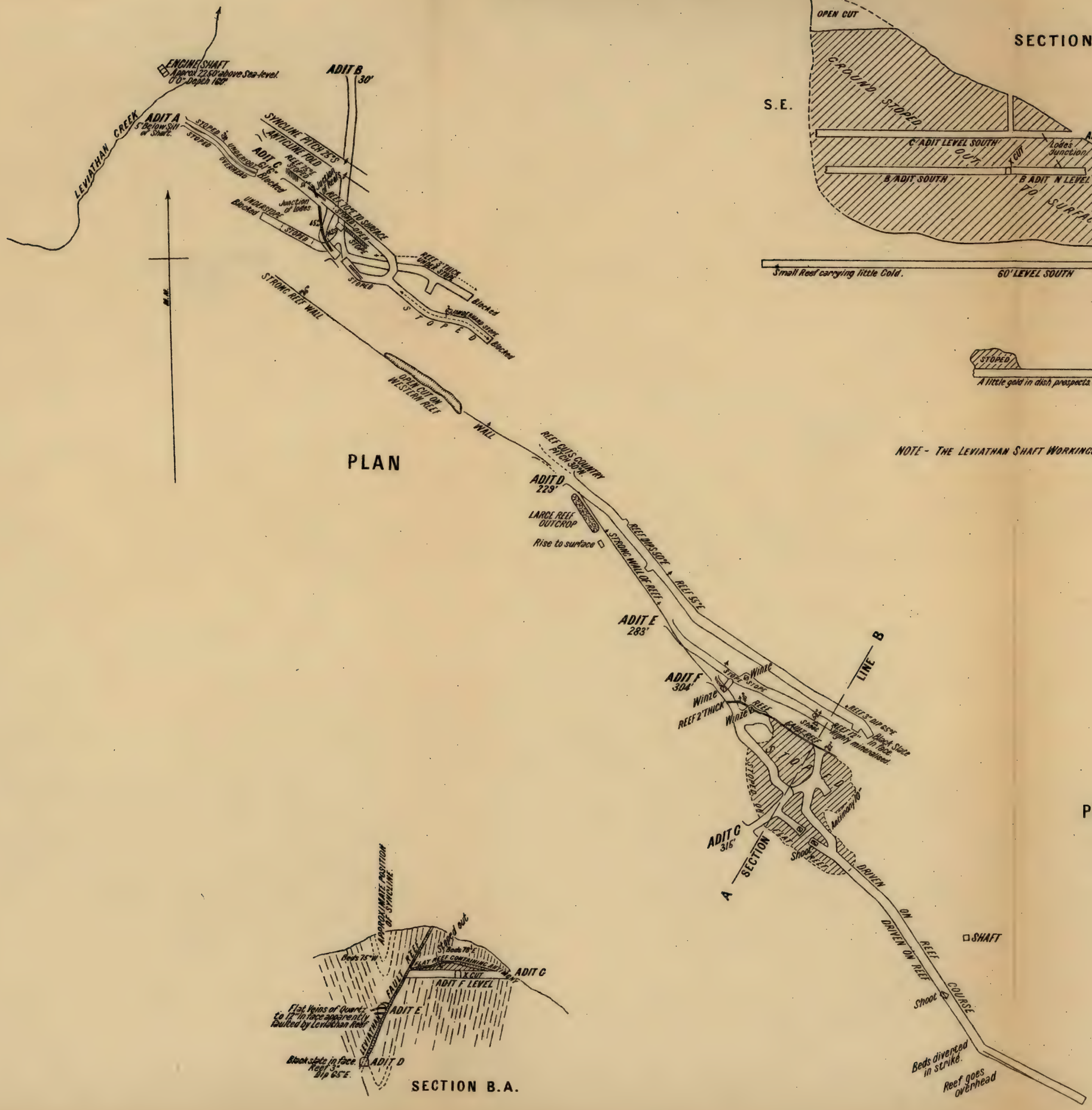
### Plan & Sections of Underground Workings.

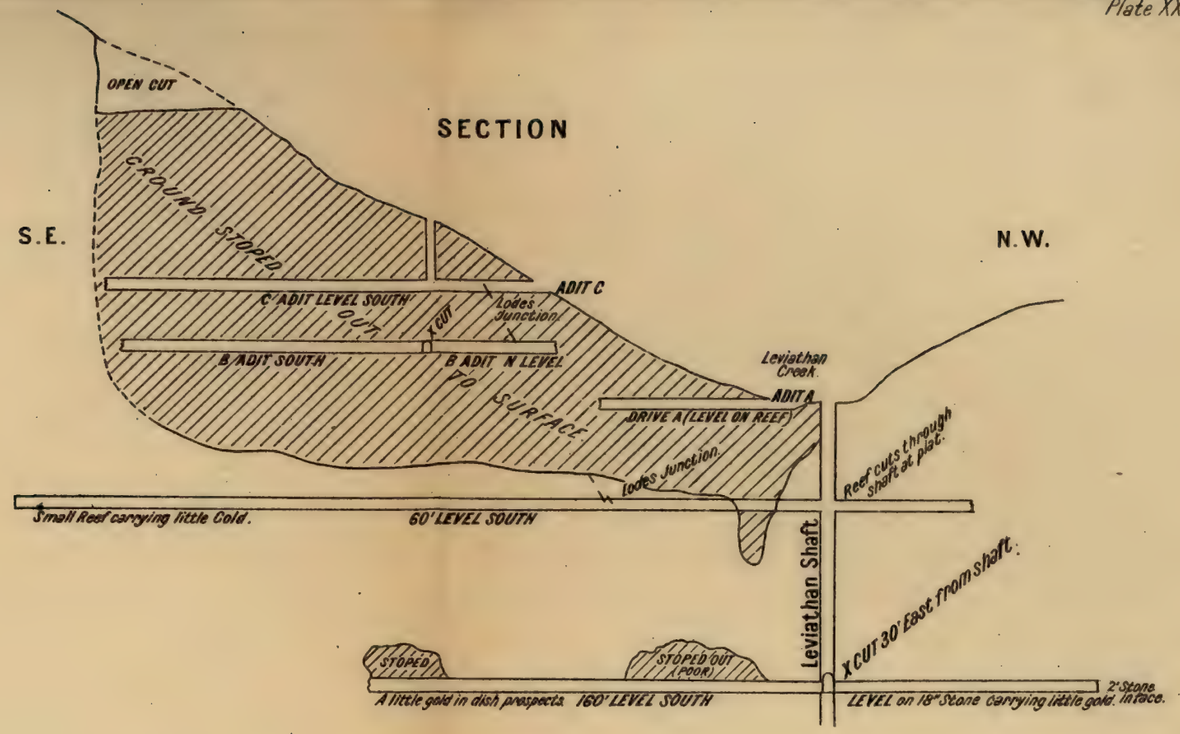
Scale - 100 feet to an Inch.

NOTE - 7,830 oz. of Gold obtained from this Mine from 11,150 Tons.

GEOLOGICAL SURVEY OF VICTORIA

No 2 LEVEL




NOTE - THE LEVIATHAN SHAFT WORKINGS ARE FROM INFORMATION ONLY.




# LEVIATHAN C. M. Co

## LEVIATHAN CREEK, WOODS POINT.

Plan & Sections of Underground Workings.

Scale - 100 feet to an Inch.

NOTE - 7,830 oz. OF GOLD OBTAINED FROM THIS MINE FROM 11,150 TONS.

GEOLOGICAL SURVEY OF VICTORIA

H Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. J. Drysdale Brown, M.L.C. Minister of Mines.

# TRANSVERSE SECTION
# SOUTH WOAH HAWP MINE
## BALLARAT EAST

Scale of Feet

0 50 100 150 200

H. Brapman del.

Geological Survey Office, Ballarat.

Sill of Shaft 1484·04' above sea level

NOTE _ Workings shown to date of cessation of operations in 1910.

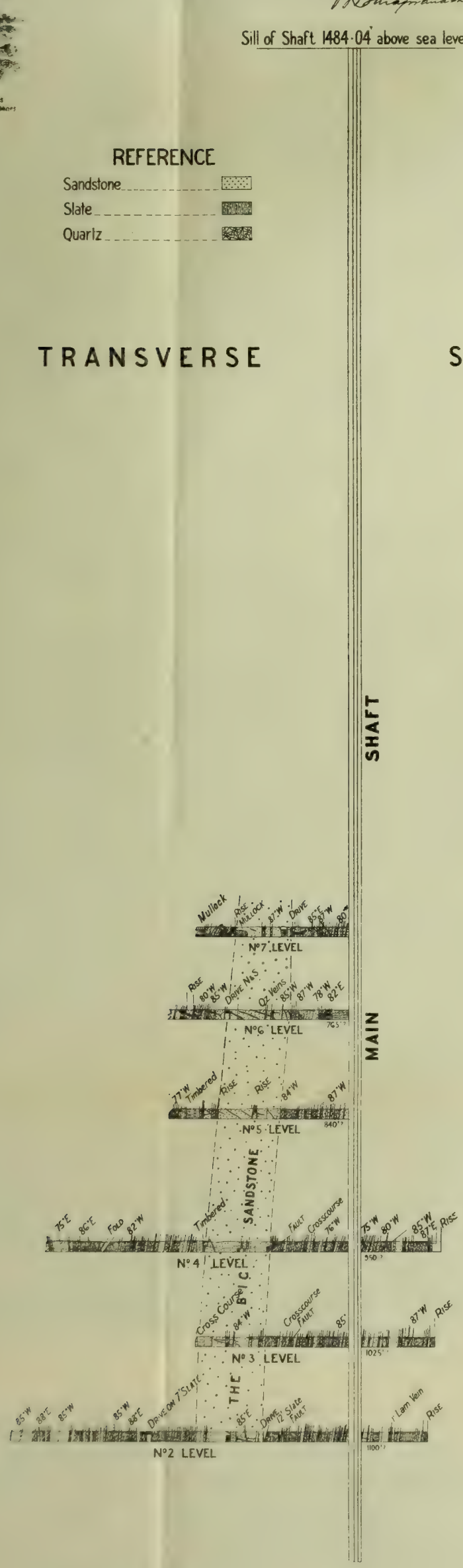
REFERENCE

Sandstone

Slate

Quartz

TRANSVERSE SECTION



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Plate N°XXVIII.




# THE EXCELSIOR AND BLUE JACKET MINES

## BLUE JACKET CREEK

## JERICHO.

### Plan of underground workings

*Scale -100 feet to an Inch.*

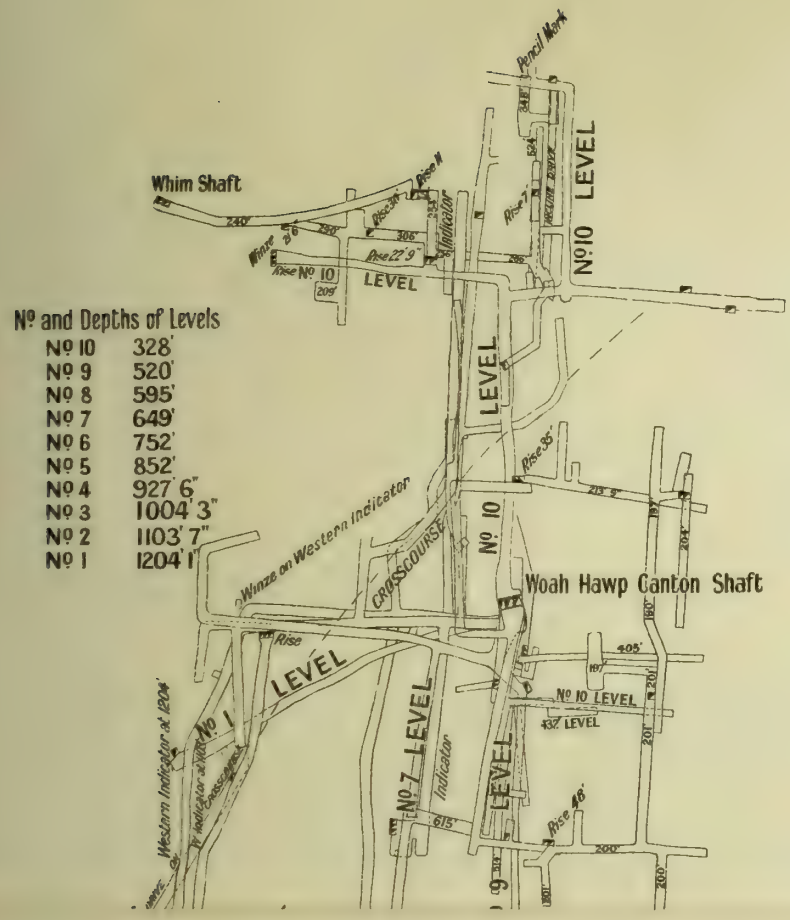
*NOTE - THE EXCELSIOR MINE YIELDED 1,332 Oz. FROM 1656 TONS CRUSHED.*

*" BLUE JACKET " " 4,969 Oz. " 7,364 " "*

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. J. Drysdale Brown, M.L.C. Minister of Mines.

Plate XXVIII.



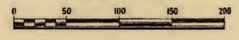

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# WOAH HAWP CANTON MINE
## TRANSVERSE SECTION

Scale of Feet

0 50 100 150 200






# WOAH HAWP CANTON, SOUTH WOAH HAWP, CLARKE'S & TINWORTH'S MINES.
## BALLARAT EAST.
## PLAN

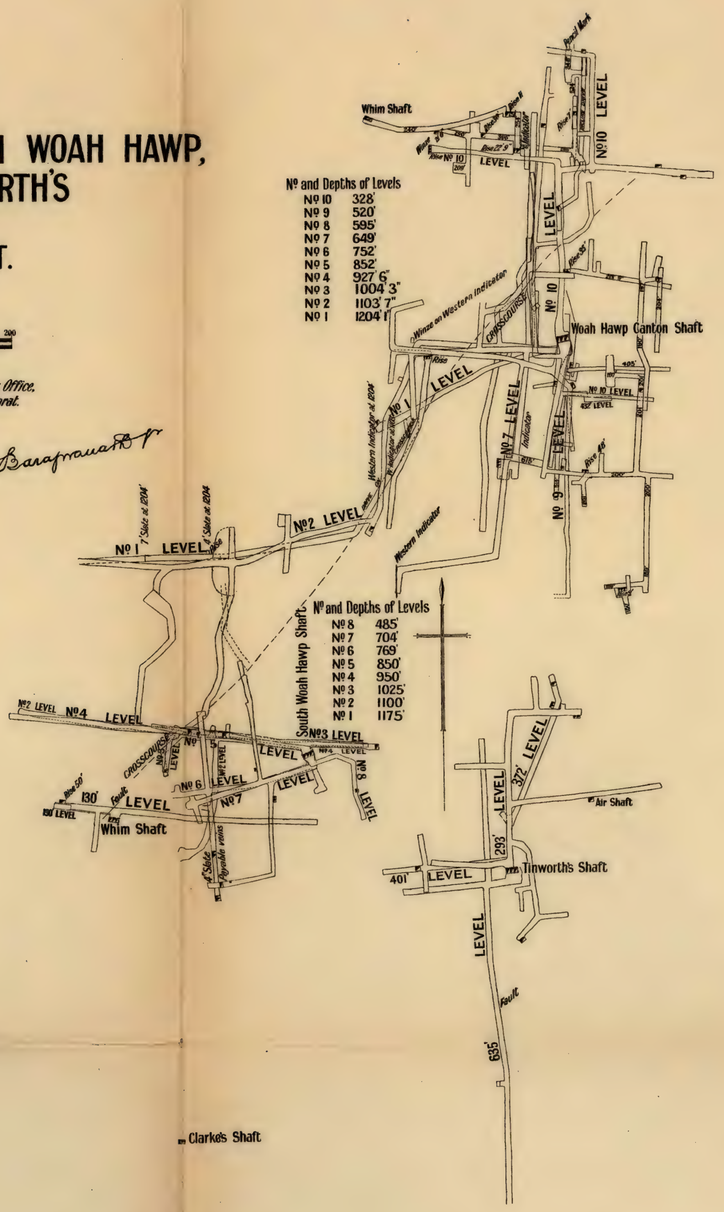
Scale of Feet

0 50 100 150 200

Geological Survey Office, Ballarat.

NOTE – Workings shown to date of cessation of operations in 1916.

H. Baragwanath Jr




# WOAH HAWP CANTON Nº 2 MINE
## TRANSVERSE SECTION

Scale of Feet.

0 50 100 150 200




OCT 2 1923
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Plate XXIX

37' above sea level.

# TRANSVERSE SECTION
# NEW INDICATOR MINE




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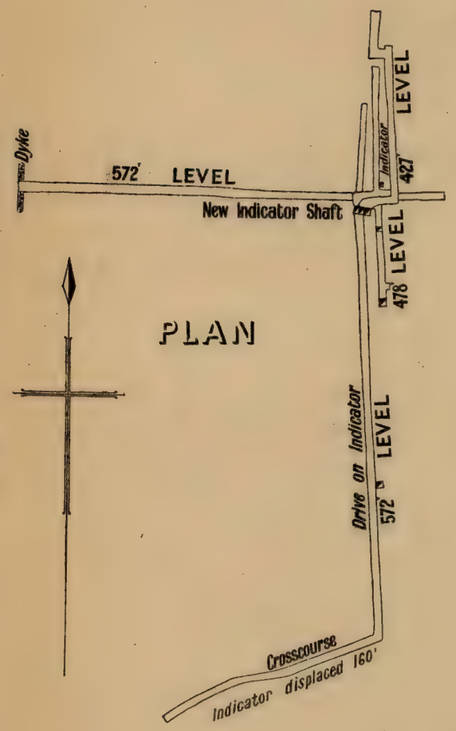
H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines.

# NEW INDICATOR & REWARD MINES.
## BALLARAT EAST.

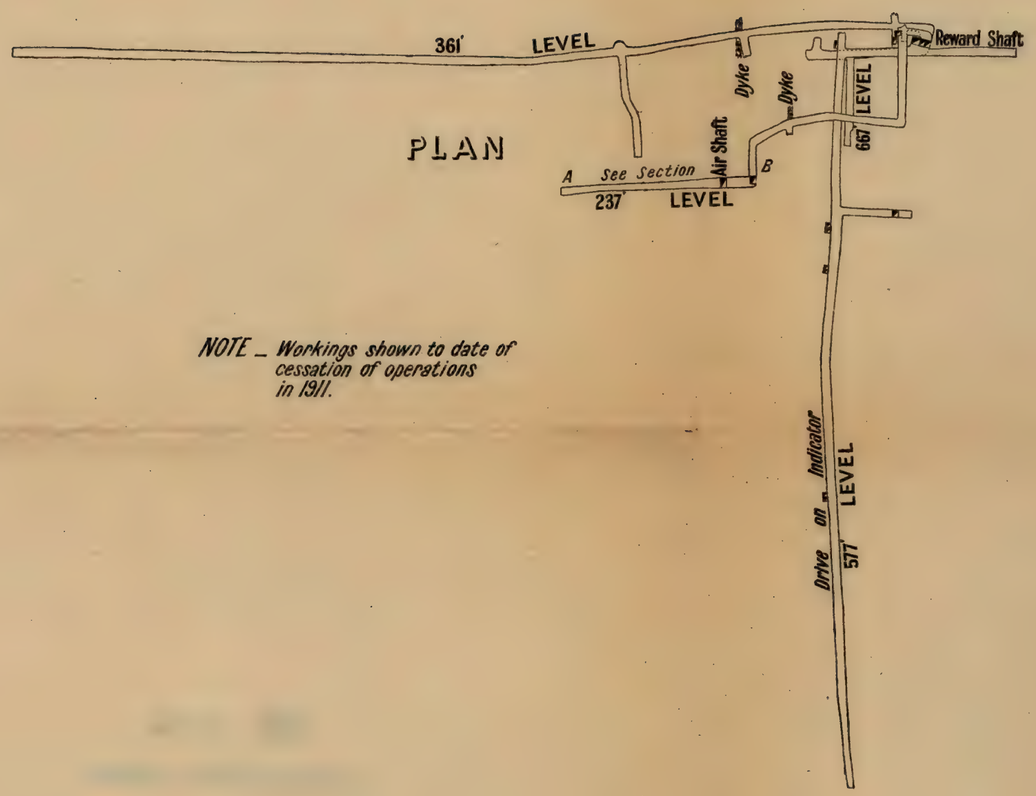
Scale of Feet.

0 50 100 150 200

Geological Survey Office,
Ballarat.




PLAN

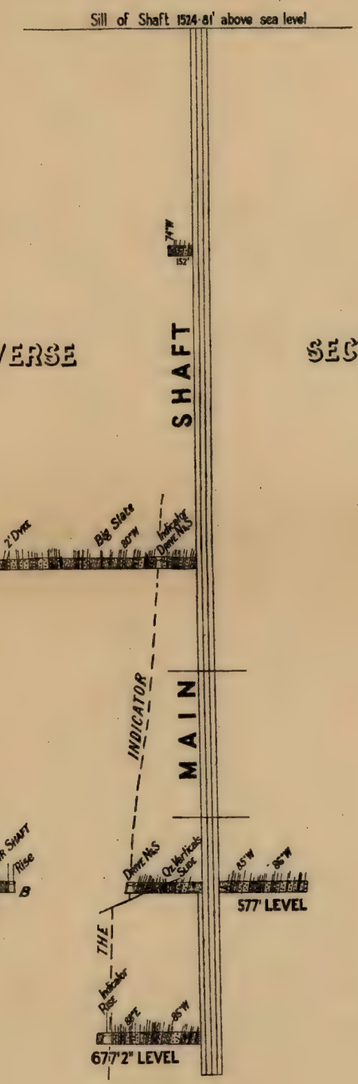



PLAN

NOTE _ Workings shown to date of cessation of operations in 1911.




TRANSVERSE SECTION
NEW INDICATOR MINE

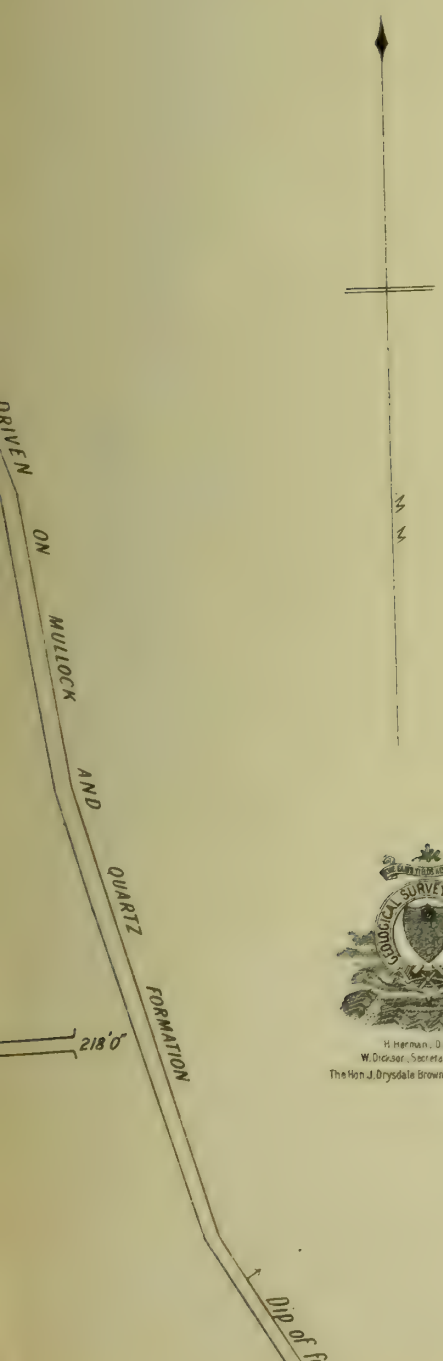



TRANSVERSE SECTION
REWARD MINE

Plate No XXIX.

Plate XXX.

ea level







H. Herman, Director
W. Dickson, Secretary for Mines.
The Hon J. Drysdale Brown, M.L.C. Minister of Mines




# NEW CHUM WORKINGS

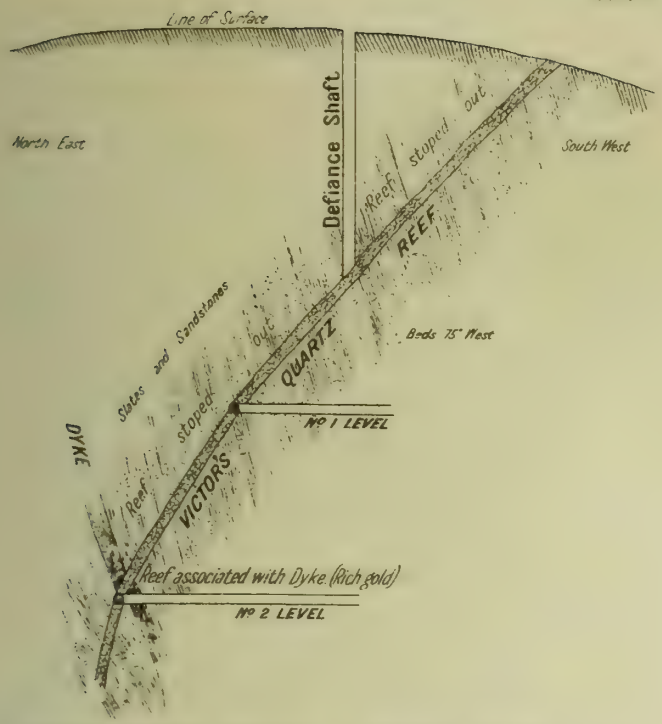
## DRY CREEK, JERICHO

### Plan of underground workings

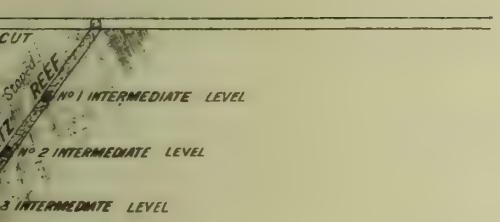
Scale - 100 Feet to an Inch.

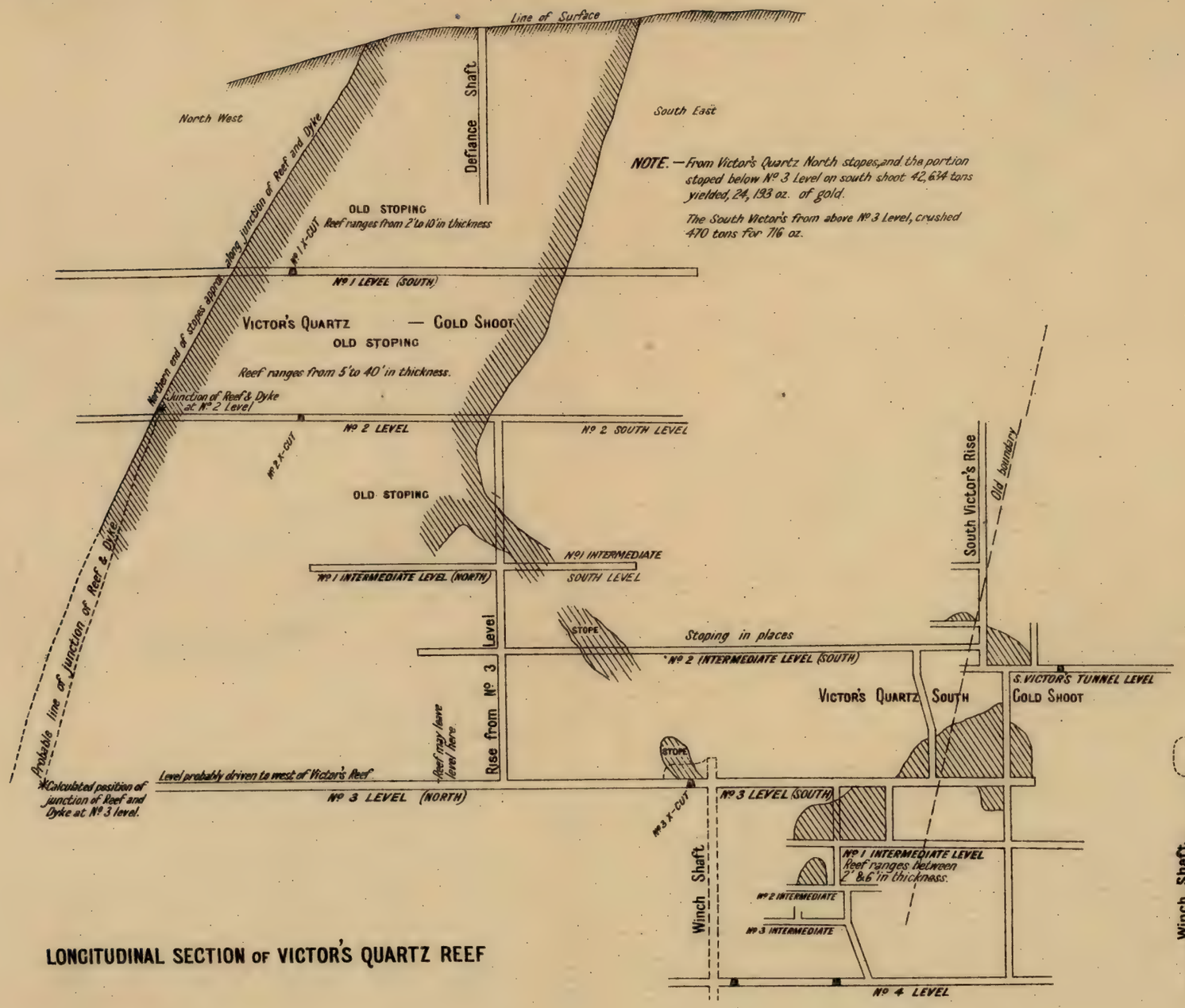
NOTE - THE NEW CHUM MINE PRODUCED 1,100 OZ. OF GOLD FROM 4,545 TONS OF STONE, LATER WHEN KNOWN AS VICTOR'S EX. TO (JAMES TONER) IT PRODUCED 139 OZ. 15 DWT. FROM 82 TONS.

Plate N.° XXX.




CROSS SECTION SHOWING UNDERLIE OF VICTOR'S QUARTZ REEF
BETWEEN Nº 2 LEVEL AND SURFACE

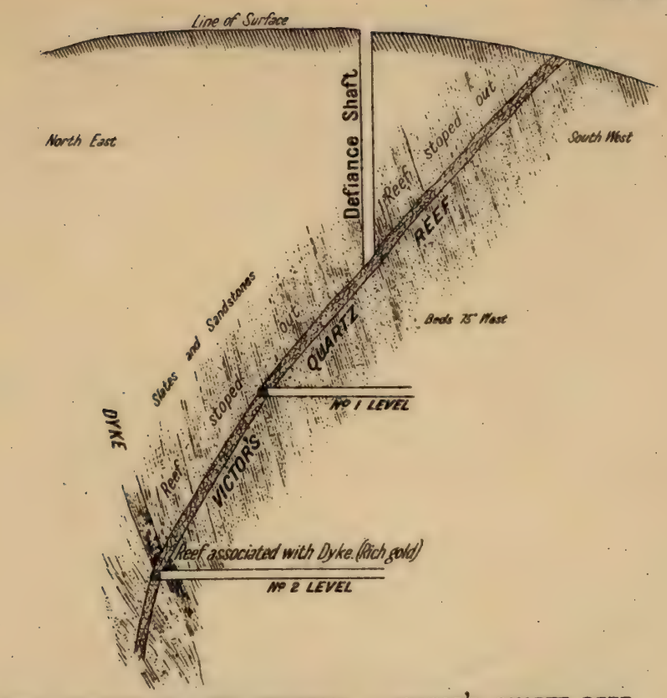




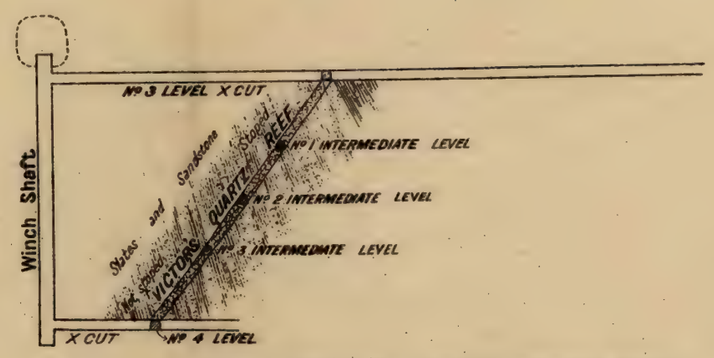

NOTE. — From Victor's Quartz North stopes, and the portion stoped below No 3 Level on south shoot 42,634 tons yielded, 24,193 oz. of gold.

The South Victor's from above No 3 Level, crushed 470 tons for 716 oz.

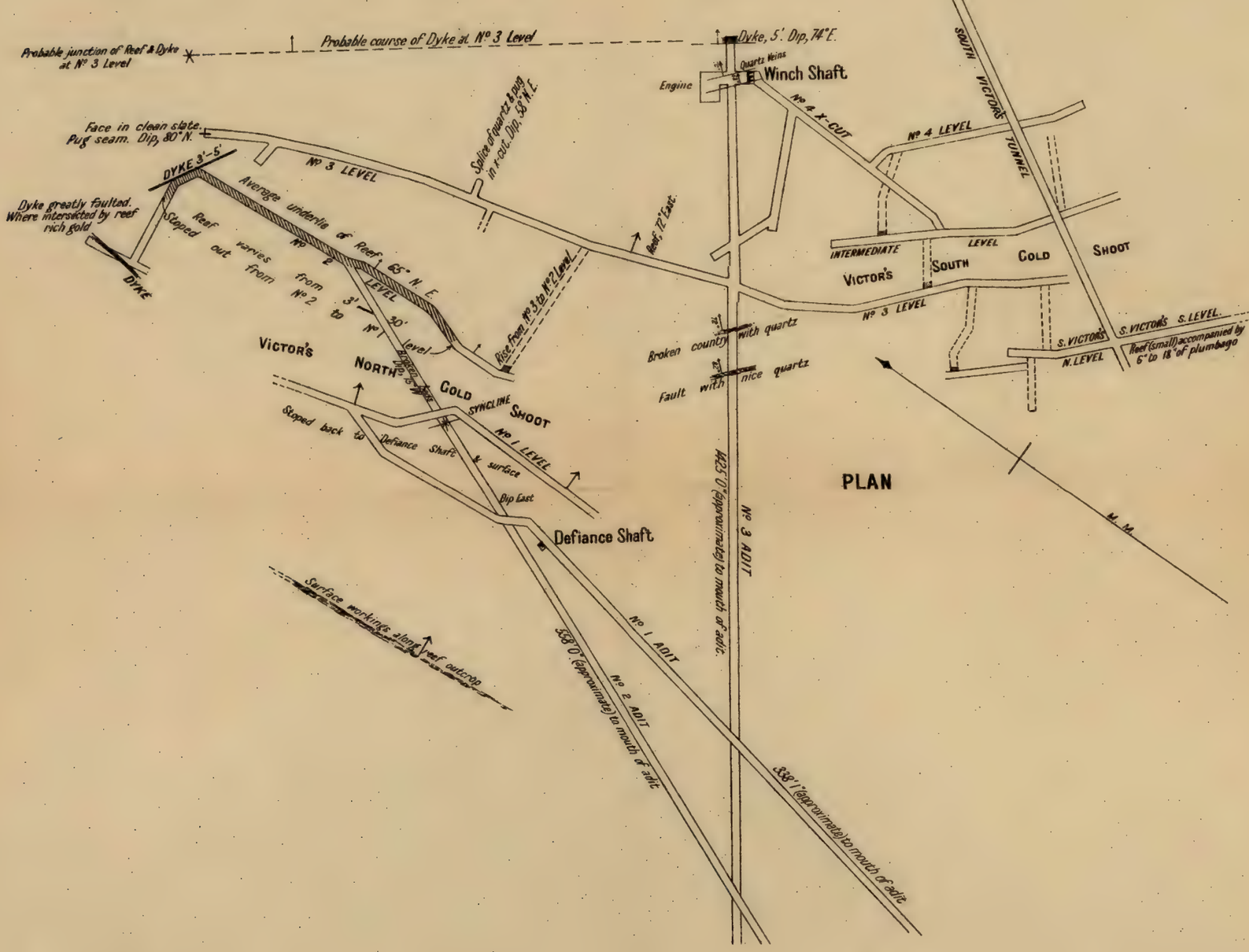
LONGITUDINAL SECTION OF VICTOR'S QUARTZ REEF




CROSS SECTION SHOWING UNDERLIE OF VICTOR'S QUARTZ REEF BETWEEN No 2 LEVEL AND SURFACE




CROSS SECTION OF VICTOR'S QUARTZ REEF BETWEEN Nos 3 AND 4 LEVELS




GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. J. Drysdale Brown, M.L.C. Minister of Mines.

# VICTOR'S QUARTZ MINES

## WOODS POINT

## Underground Workings

Scale — 100 Feet to 1 Inch.

*SILL OF DEFIANCE SHAFT APPROX. 3,200 FEET ABOVE SEA.*

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A., Minister of Mines.

# WOAH HAWP N°1 MINE
## BALLARAT EAST
## TRANSVERSE SECTION

Scale of Feet.

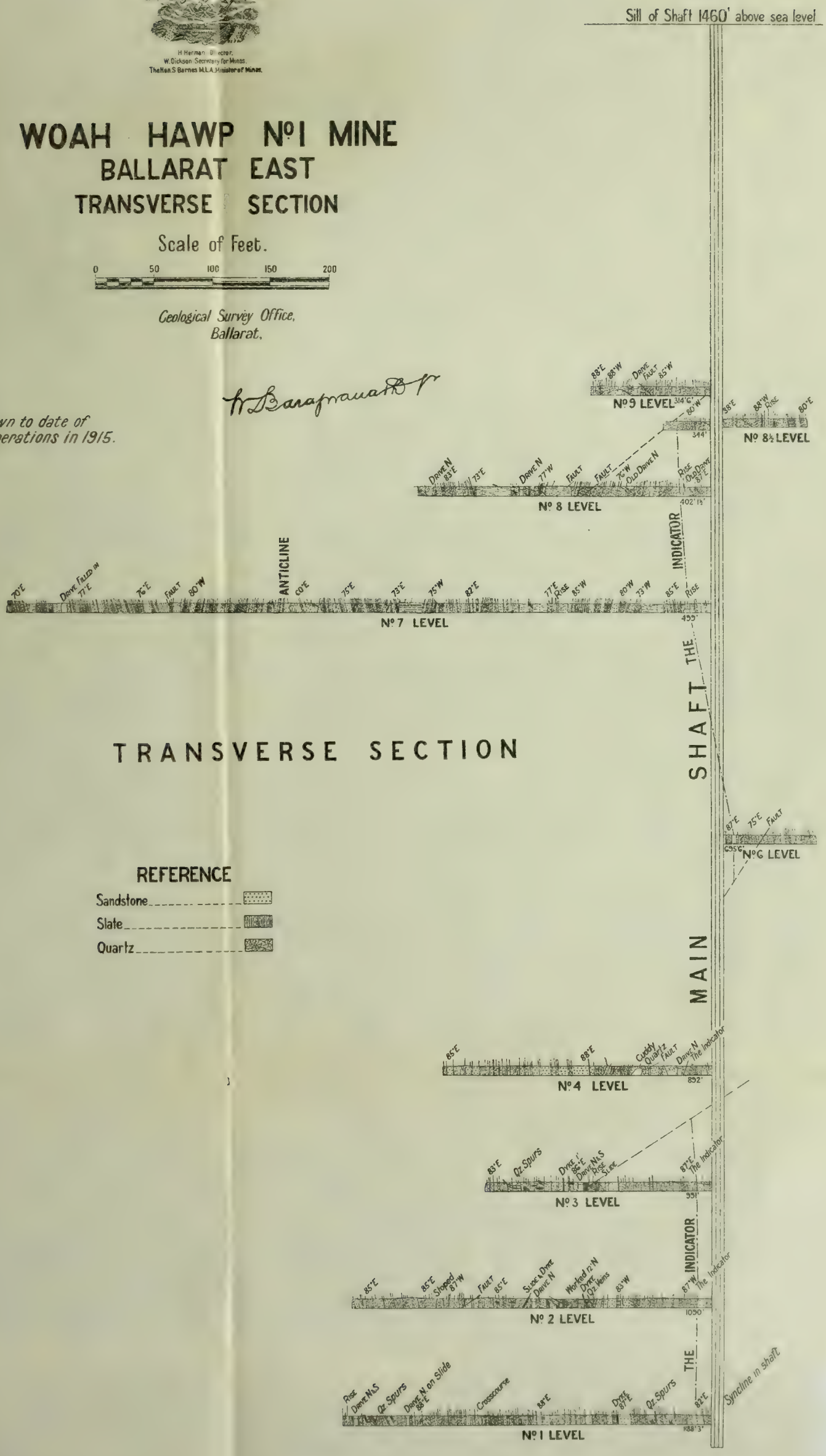
0 50 100 150 200

*Geological Survey Office,*
*Ballarat,*

W. Baragwanath Dir

*NOTE _ Workings shown to date of cessation of operations in 1915.*

## TRANSVERSE SECTION




### REFERENCE

Sandstone
Slate
Quartz

# WOAH HAWP CENTRAL MINE
## BALLARAT EAST.

Scale of Feet.

0 50 100 150 200

H. Herman
Geological Survey Office,
Ballarat

REFERENCE

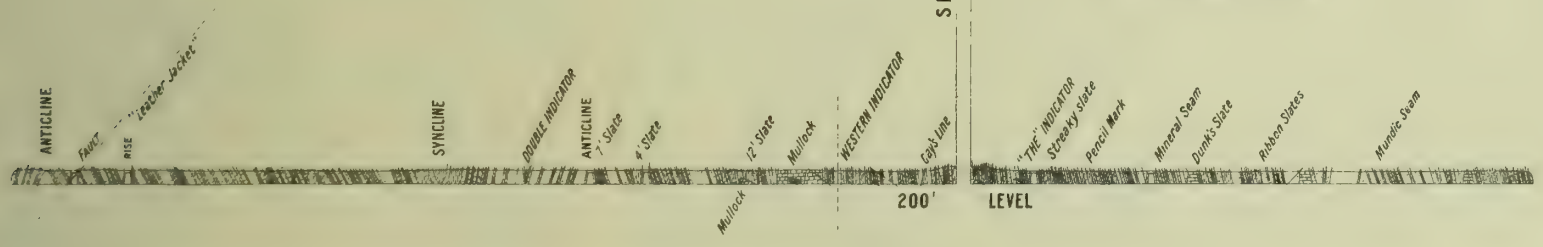
Sandstone
Slate
Quartz

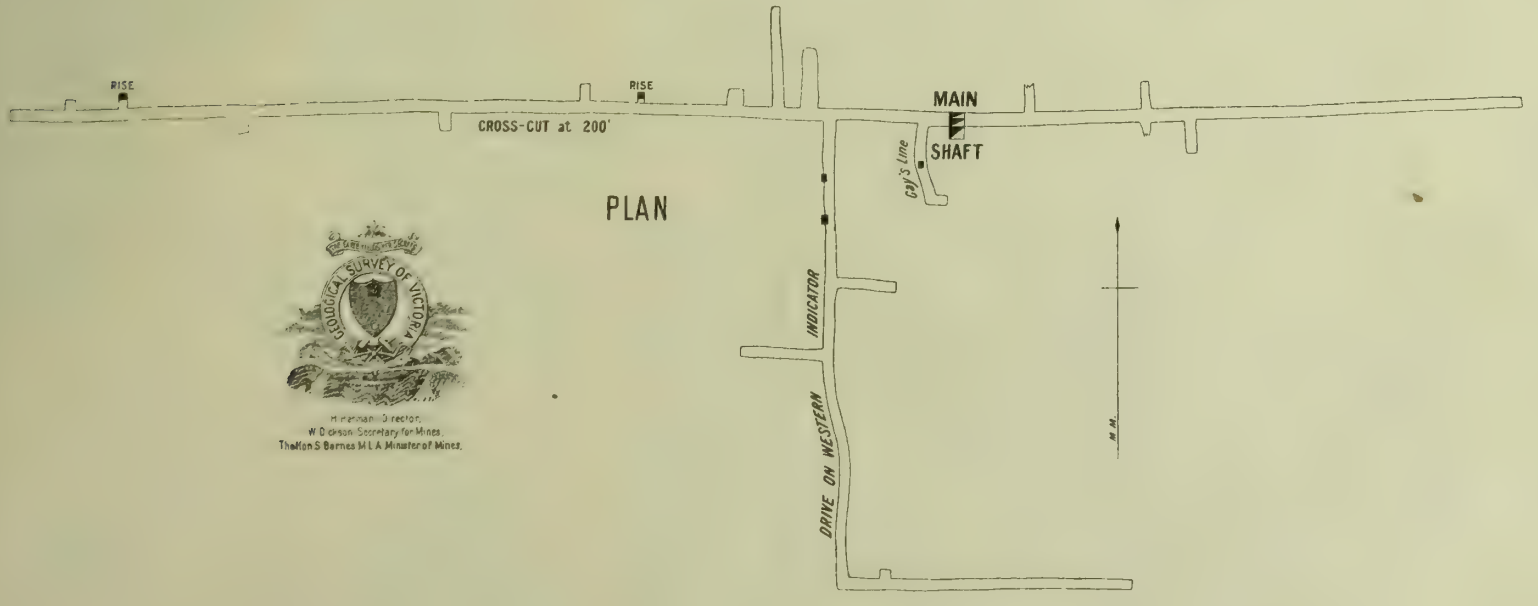
NOTE – Workings shown to date of cessation of operations in 1905.

## TRANSVERSE SECTION

Sill of Shaft 1422·89' above sea level

NOTE:– The names given to the various beds are those supplied by the Manager.



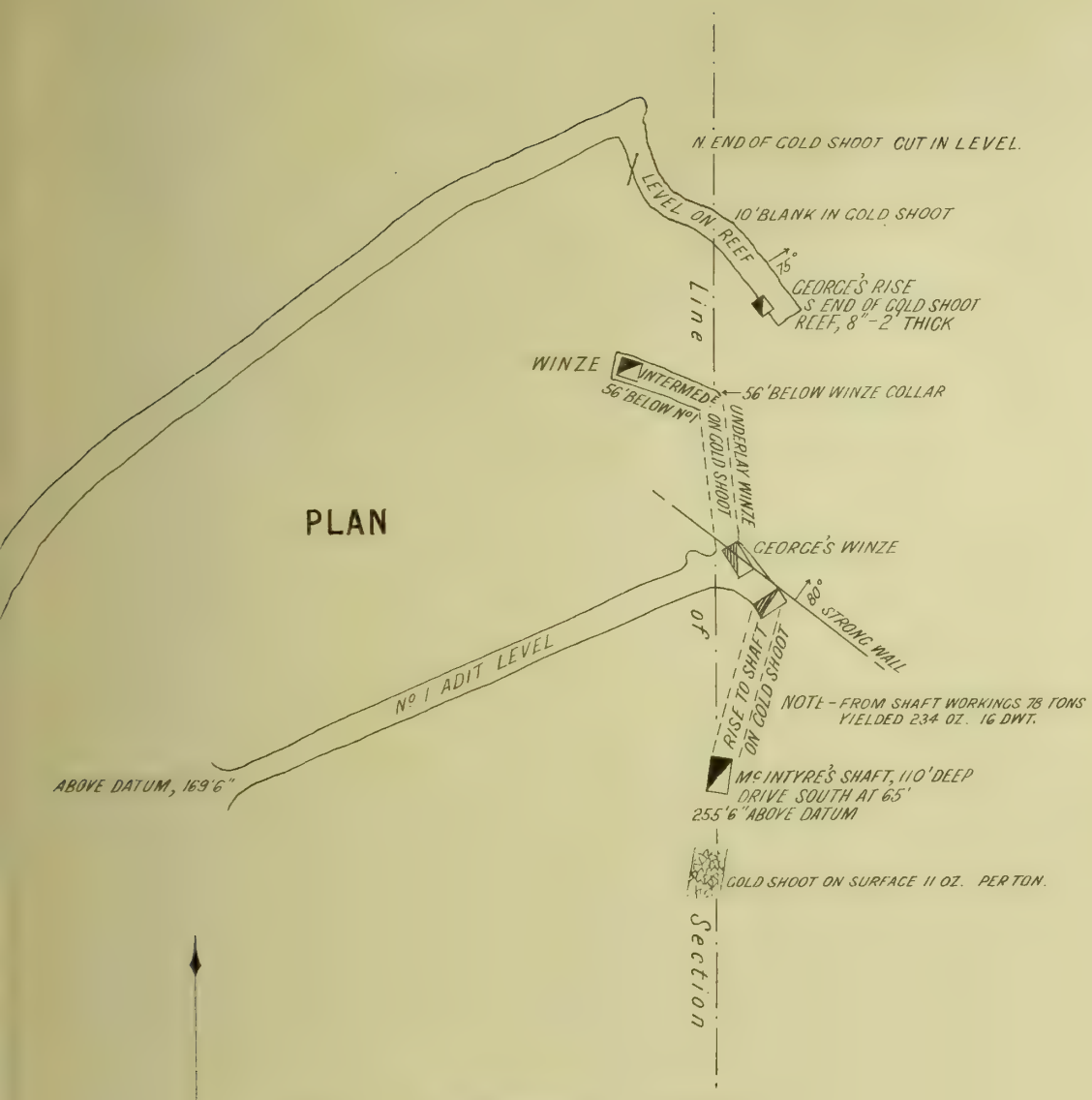




## PLAN

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. S. Barnes M.L.A. Minister of Mines.

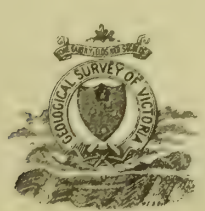
Plate No XXXI.

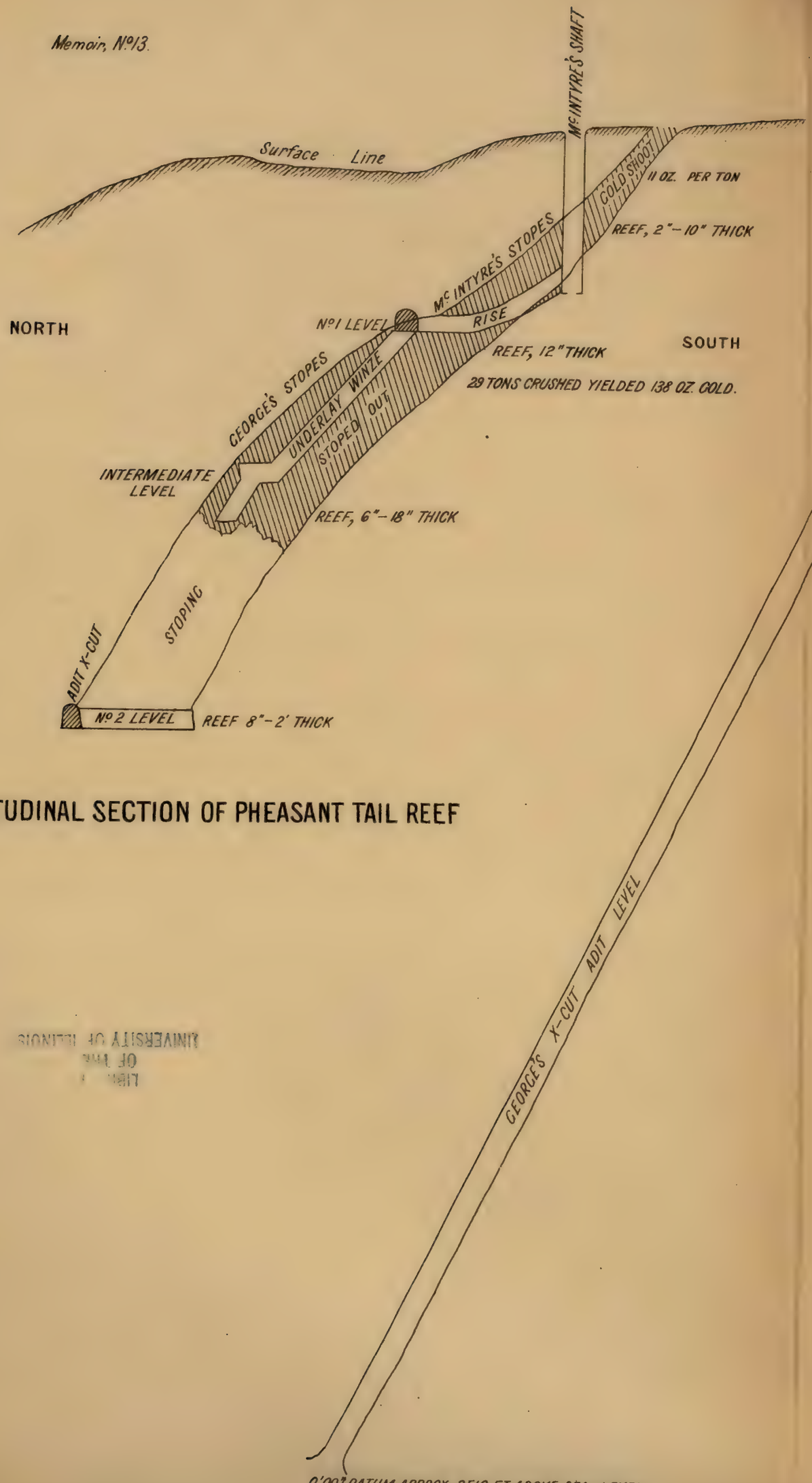



# PLAN & LONGITUDINAL SECTION OF
# THE PHEASANT TAIL MINE
## (LATE NORTH Mc INTYRES)
## ROSS'S CREEK
## WOODS POINT

Scale.— 60 Feet to 1 Inch.

M. M.






## LONGITUDINAL SECTION OF PHEASANT TAIL REEF

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PLAN & LONGITUDINAL SECTION OF

# THE PHEASANT TAIL MINE

(LATE NORTH McINTYRES)

ROSS'S CREEK

WOODS POINT

Scale.— 60 Feet to 1 Inch.

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. J. Drysdale Brown, M.L.C. Minister of Mines.

Plate XXXII




GEOLOGICAL SURVEY OF VICTORIA
H. Herman Director
W. Dickson, Secretary for Mines.
The Hon. S. Barnes M.L.A. Minister of Mines

# WOAH HAWP No 2 MINE

## BALLARAT EAST.

*Scale of Feet.*

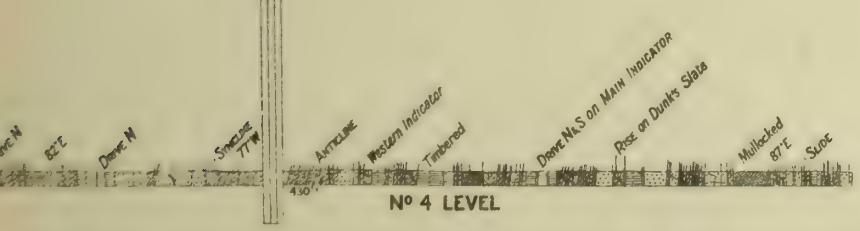
0 50 100 150 200

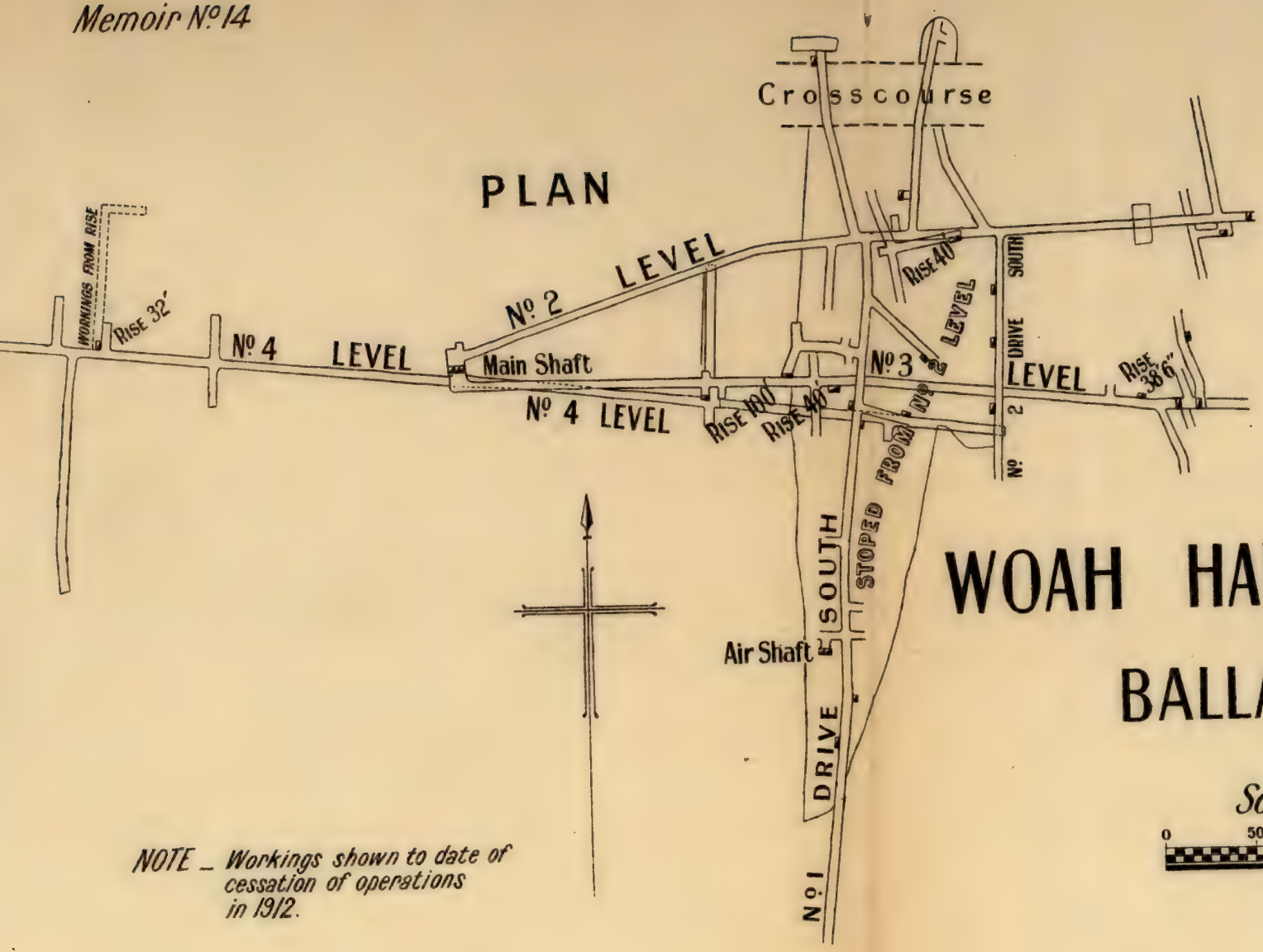
J. Bonaparte

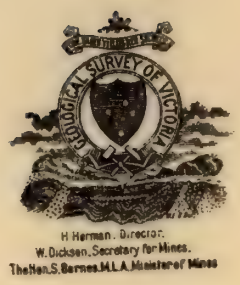
*Geological Survey Office,*
*Ballarat.*
31-7-14

Sill of Shaft 1361·37' above sea level

## SECTION






# WOAH HAWP No 2 MINE

## BALLARAT EAST.

*Scale of Feet.*

0 50 100 150 200

*NOTE – Workings shown to date of cessation of operations in 1912.*

*Geological Survey Office, Ballarat.*

Whim - Shaft

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OCT 2 1923

31-7-14

## REFERENCE

Sandstone

Slate

Quartz

## TRANSVERSE SECTION

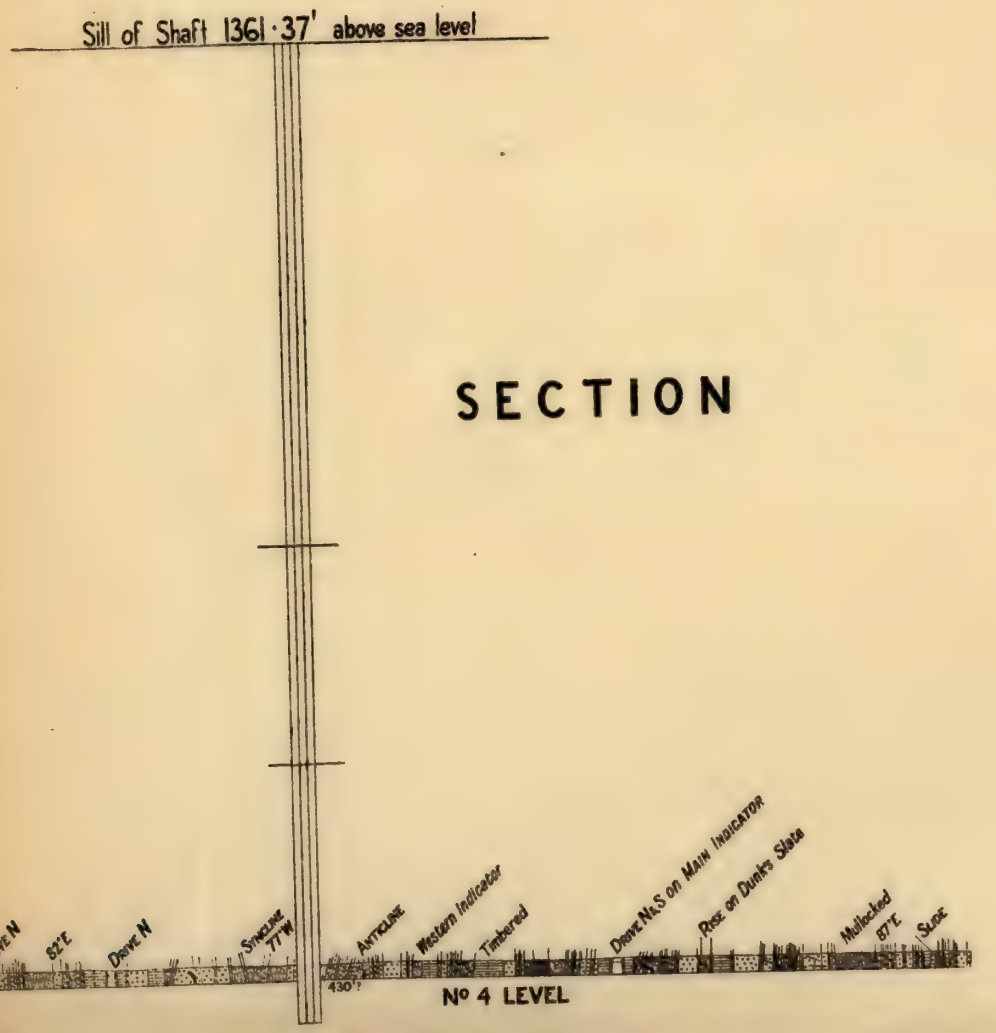


Plate No. XXXII.

Dyke Dip 87° W.

B. B. CREEK

Rich alluvial gold

5 HEAD BATTERY

WEST

JORDAN

SLATES

DYKE

DYKE

SLATES

F 6" SHOWING GOLD

VALLEY

SLUICE

REEF 10" SHOWING GOLD

IER

HYDRAULIC

REIGHTON AND WHITES REEF 12"-18"

OCCURS ON WALL

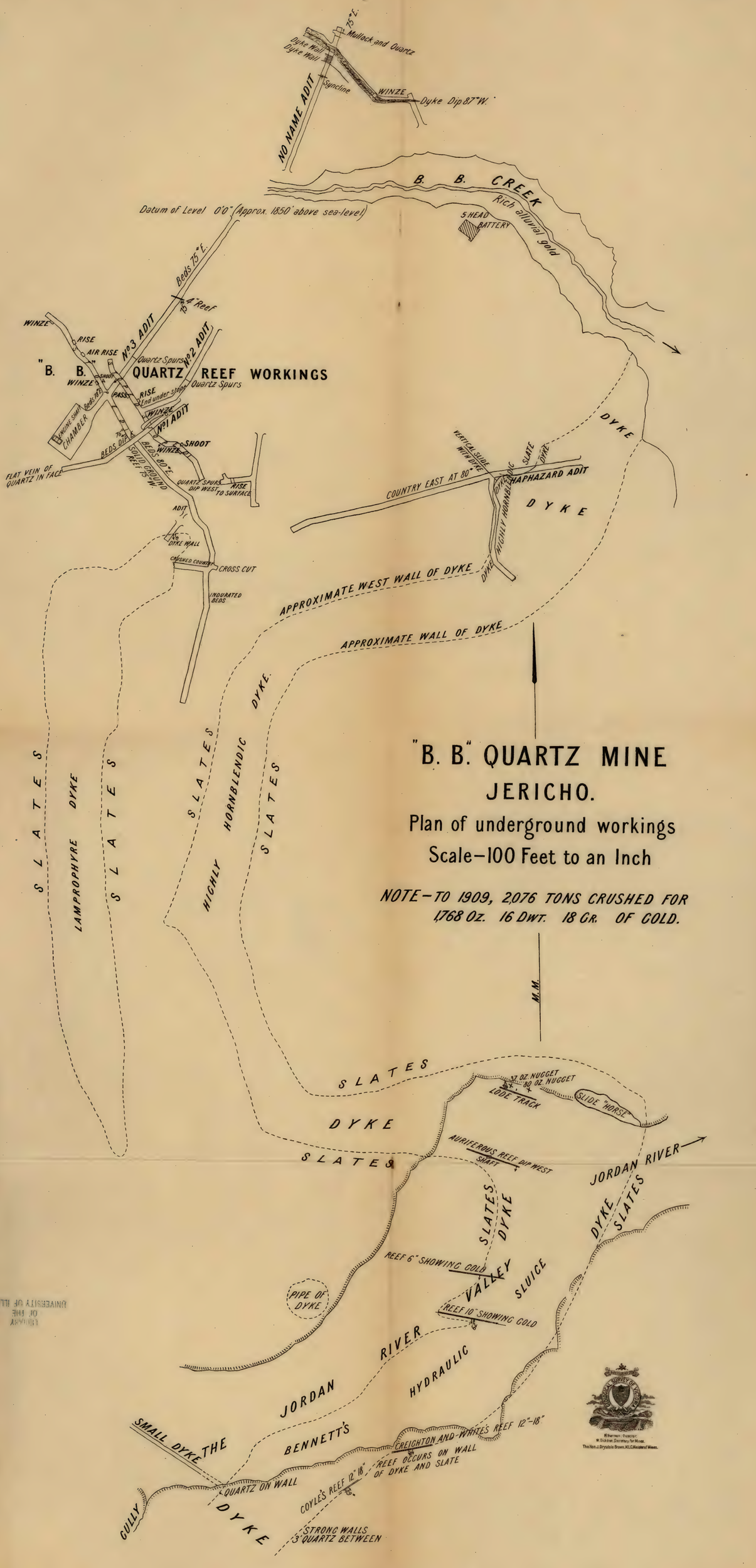
KE AND SLATE

GEOLOGICAL SURVEY OF VICTORIA

H Herman, Government

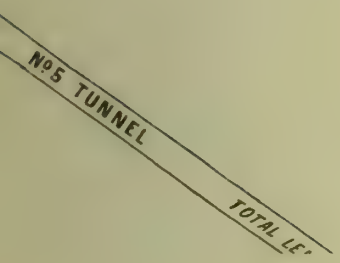
W Dickinson, Secretary for Mines

The Hon J Drysdale Brown M.L.C. Minister of Mines.




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Plate N°XXXIII.



GENERAL LINE OF STRIKE OF DYKE & PERPENDICULAR OF CROSS SECTIONS

A B C D E F G H

SHAFT 100'

Chamber at N°3 Level

E. WALL OF DYKE AT N°5 LEVEL

E. WALL OF DYKE AT N°4 LEVEL

E. WALL OF DYKE AT N°3 LEVEL

E. WALL OF DYKE AT N°2 LEVEL

E. WALL OF DYKE AT N°1 LEVEL

E. WALL OF DYKE AT N°1 INTERMEDIATE LEVEL

E. WALL OF DYKE AT N°2 INTERMEDIATE LEVEL

W. WALL OF DYKE AT N°5 LEVEL

W. WALL OF DYKE AT N°1 LEVEL

W. WALL OF DYKE AT LOCH NESS

Small leaders in sandstone capping gold

Rise

Rise from N°2 Level

Rise to Surface

N°5 LEVEL

N°4 LEVEL

N°3 LEVEL

N°2 INTERMEDIATE LEVEL

N°1 INTERMEDIATE LEVEL

N°1 TUNNEL LEVEL

N°3 TUNNEL

DRIVE ON E. XCUT

N. DRIVE ON E. XCUT REEF

SHAFT from surface.

STOPES IN N°2 INTERMEDIATE LEVEL WALLS ABOVE

OPEN CUT

OPEN CUT

THE BLUFF

WOMEN TUNNEL

OLD TUNNEL

OLD TUNNEL

N°2 TUNNEL

N°5 TUNNEL

TOTAL LENGTH 1968'

R.L. AT TUNNEL MOUTH 1538

R.L. 1201-90

R.L. 1185-34

R.L. 1171-84

R.L. 1148-8

R.L. 1198-79

R.L. 1194-24

LOCH NESS SHAFT
R.L. 2194-24
Depth 185'

LOCH NESS TUNNEL

R.L. 1946-7

M. M.

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director.
W. Dickson, Secretary for Mines.
The Hon. J. Drysdale Brown M.L.C. Minister of Mines.

# Plan of Underground Workings
# NEW LOCH FYNE G. M. Co.

Scale,- 60 feet to 1 inch.

*NOTE,- New Loch Fyne to 1911 crushed 117,930 Tons for 85,963 Ozs. Gold.*

*NOTE, Plan and Section prepared by Company's Officers.*

CONSOLS

NOTE — This lode occurs on the Black Slate (Indicator) on the side of Consols Anticline between the Anticline and the S

# STAR OF THE EAST AND BAND AND ALBION GROUP OF MINES

## BALLARAT.

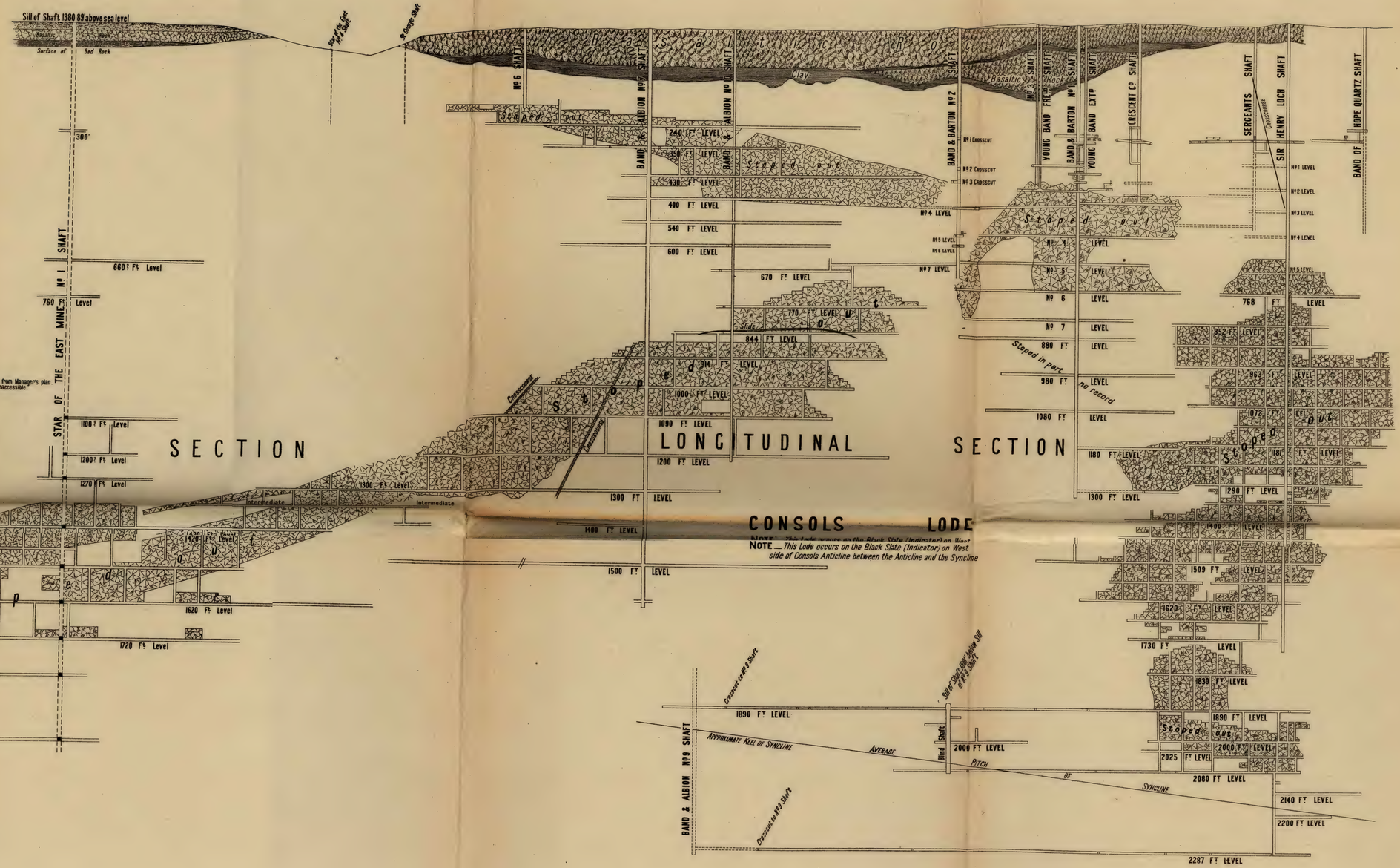


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### LONGITUDINAL SECTION

Scale of Feet
200 100 0 200 400

W. Baragwanath
December 1911.




### LONGITUDINAL SECTION

### CONSOLS LODE

NOTE — This Lode occurs on the Black Slate (Indicator) on West side of Consols Anticline between the Anticline and the Syncline

# D AND LOCH MINE

Plate 6A

## 9 SHAFT BAND AND ALBION.)

## DING STAR LODE

## EDAN, BALLARAT.

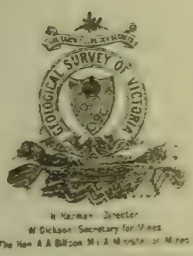
## ONGITUDINAL SECTION

Scale of Feet

50 0 100 200

W. Baragwanath

December 1911.




H. Hazman Director
W. Dickson Secretary for Mines
The Hon. A. A. Billson M.L.A. Minister of Mines

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*rry Formation associated with*
*ault stoped here. Values irregular*

# BAND AND LOCH MINE

## (N°9 SHAFT BAND AND ALBION.)

## GUIDING STAR LODE

## REDAN, BALLARAT.

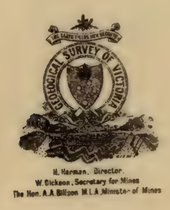
## LONGITUDINAL SECTION

Scale of Feet

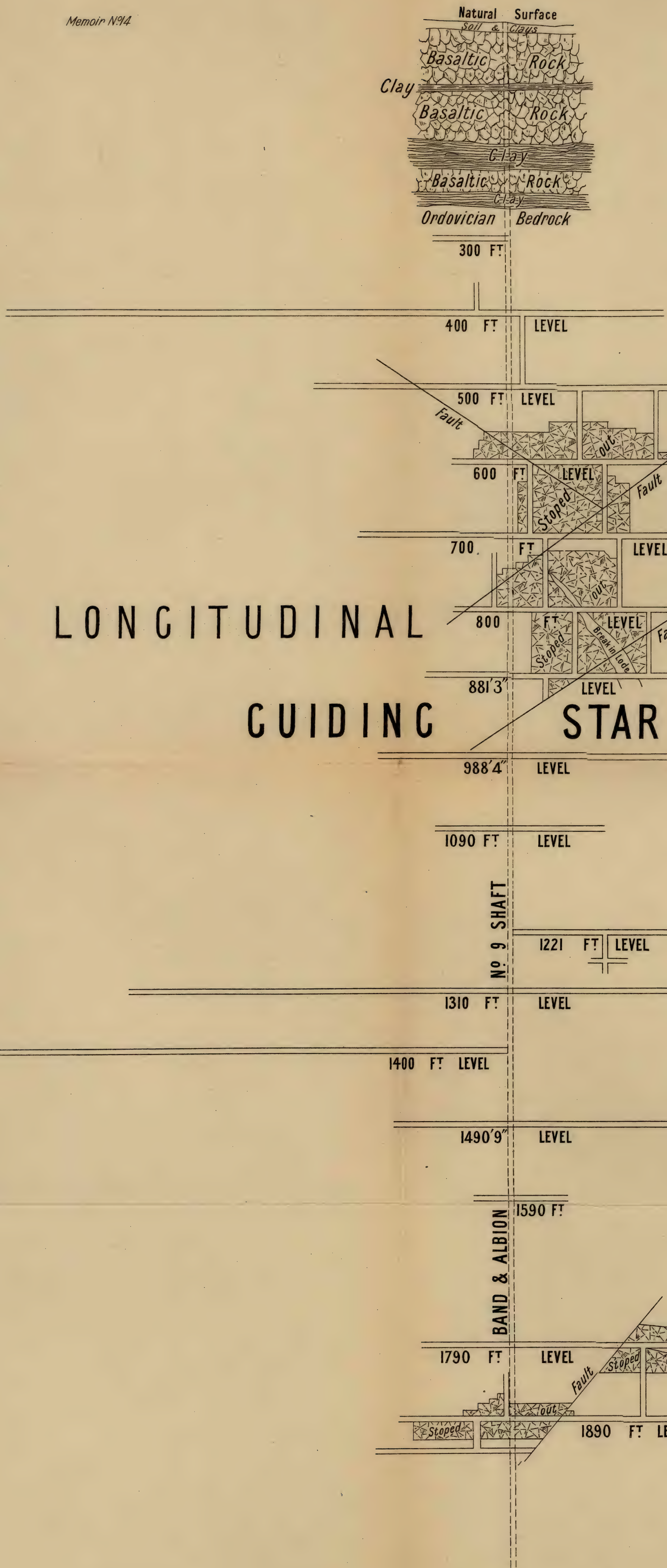
100 50 0 100 200

W. Baragwanath

December 1911.




H. Herman, Director.
W. Dickson, Secretary for Mines
The Hon. A.A. Billson M.L.A. Minister of Mines




LONGITUDINAL SECTION

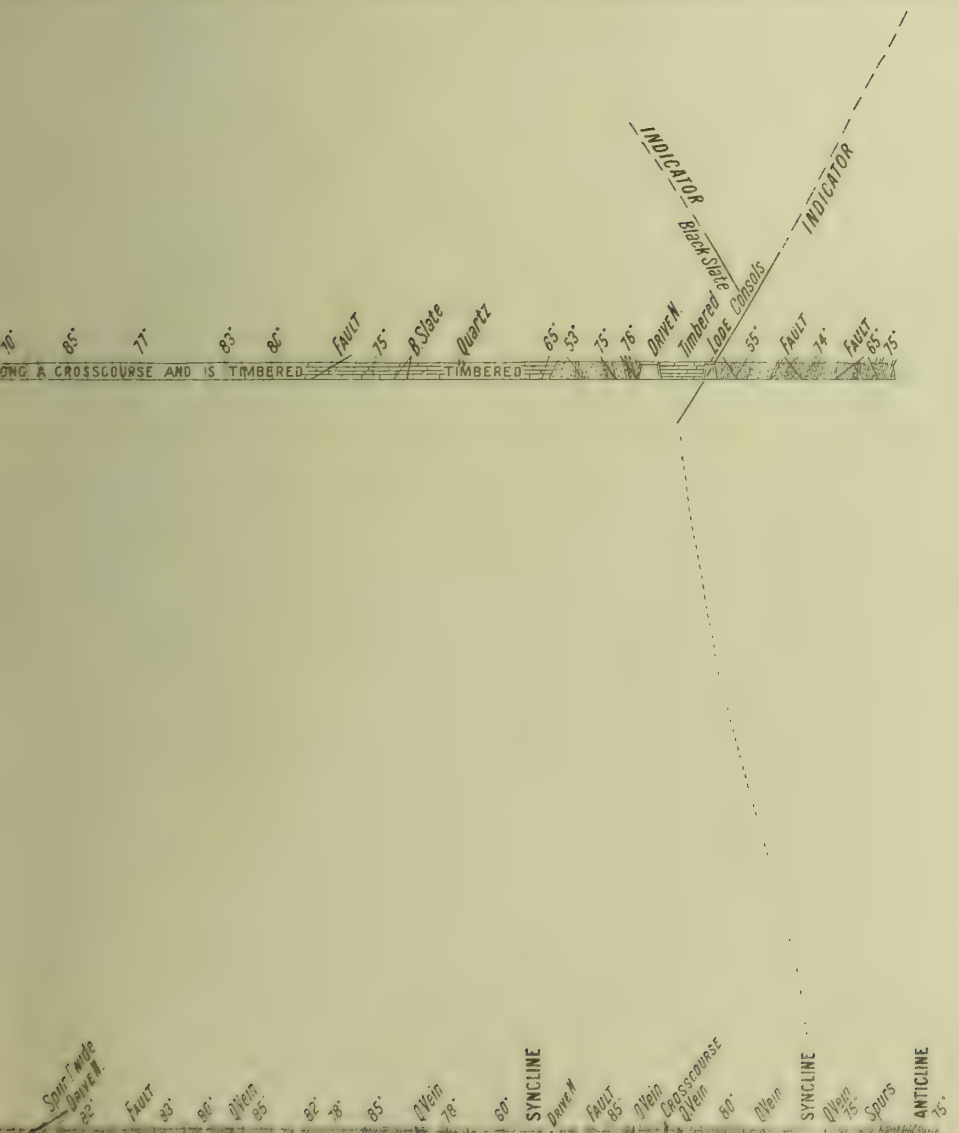
GUIDING STAR LODE

**NOTE-**
*This Lode occurs on the Black Slate (Indicator) on West side of Guiding Star Anticline between the Anticline and the Syncline*

**NOTE-**
*Spurry Formation associated with a Fault stoped here. Values irregular*

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Plate 6


INDICATOR
Black Slate
Timbered
Lode Consols
INDICATOR
70°
85°
77°
83°
86°
FAULT
75°
B.Slate
Quartz
65°
53°
75°
76°
Drive N.
55°
FAULT
74°
FAULT
85°
75°
ONG A CROSSCOURSE AND IS TIMBERED
TIMBERED
Spur Ridge
Drive N.
FAULT
83°
90°
Q Vein
95°
82°
78°
85°
Q Vein
78°
60°
SYNCLINE
Drive N
FAULT
85°
Q Vein
Crosscourse
Q Vein
60°
Q Vein
SYNCLINE
Q Vein
75°
Spurs
ANTICLINE
75°
2287 FT. 6 In. LEVEL

# BAND AND LOCH MINE

## (No. 9 SHAFT BAND AND ALBION.)

## GUIDING STAR LODE.

## REDAN, BALLARAT

## TRANSVERSE SECTION

Scale of Feet

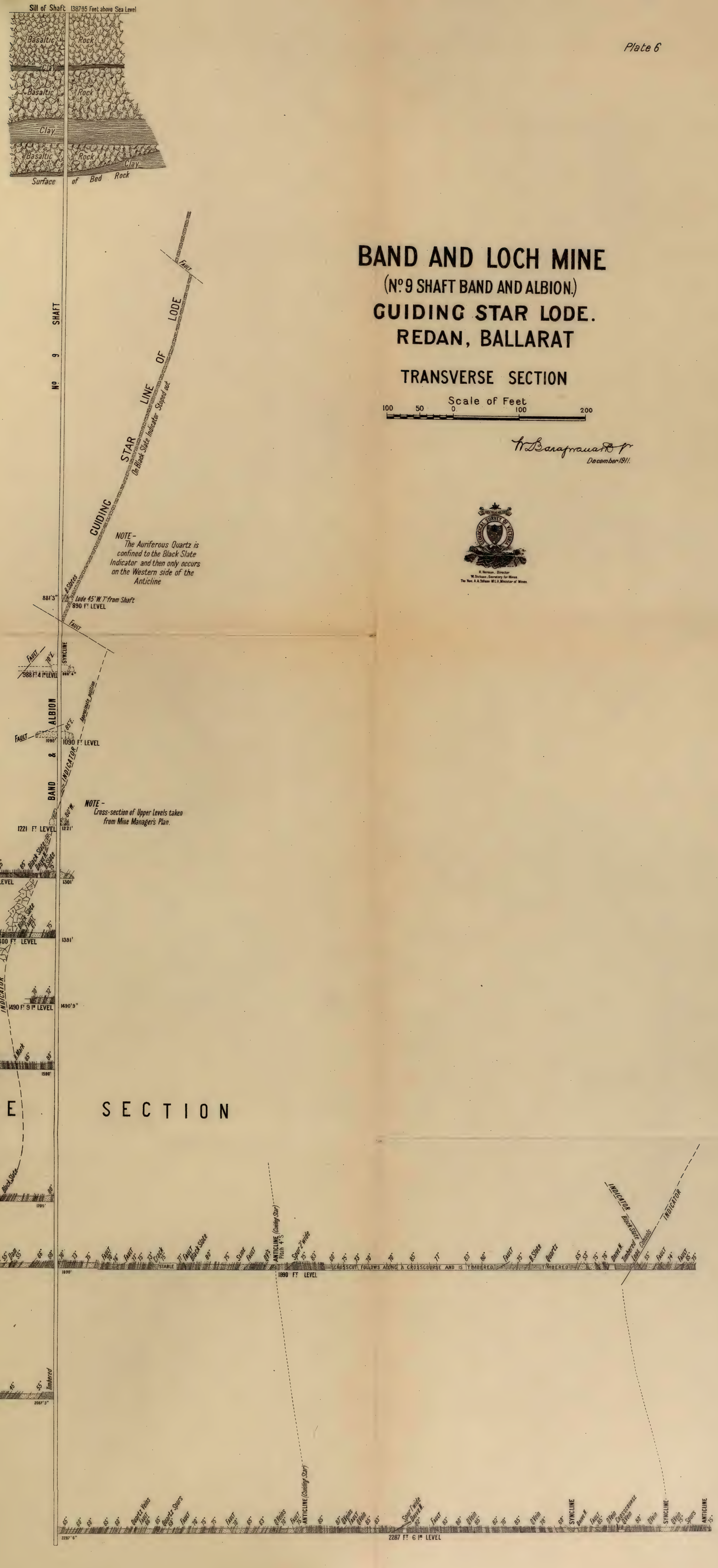
100 50 0 100 200

W. Baragwanath

December 1911.

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director
W. Dickson, Secretary for Mines
The Hon. A.A. Sillano M.L.A. Minister of Mines




# TRANSVERSE SECTION

Plate 5


Sill of Shaft 1418·18 Feet above Sea Level
Basaltic
Ordovician
Rock
Bedrock
1730 FT LEVEL
1620 FT LEVEL
1509 FT LEVEL
1400 FT LEVEL
1290 F
1811
Fault
Quartz Veins
Fold
Drift
Mark
Lode 26
CONSOLS
LINE
On Back
Sista Indicator
OF

# BAND AND LOCH MINE

## (SIR HENRY LOCH SHAFT)

## REDAN, BALLARAT

## TRANSVERSE SECTION

Scale of Feet

100 50 0 100 200

W. Baragwanath Del.

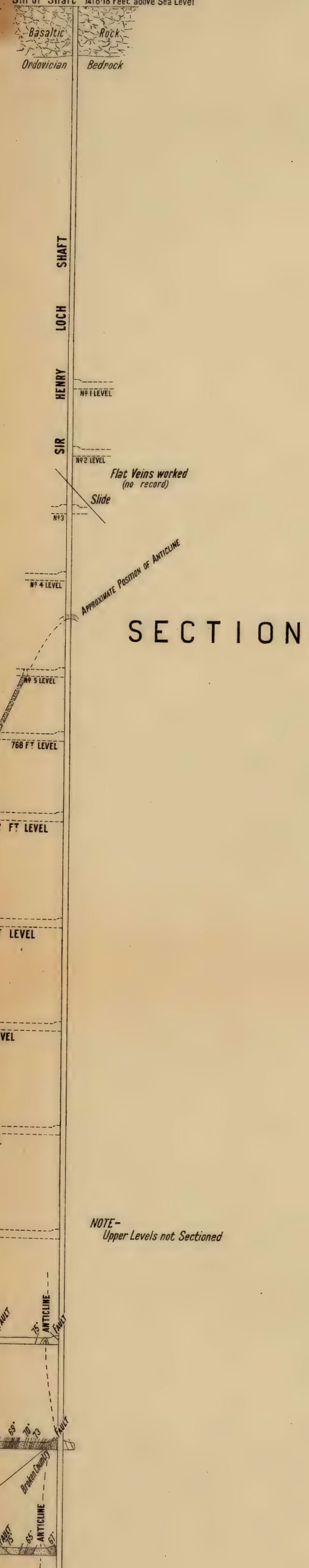
December 1911.

GEOLOGICAL SURVEY OF VICTORIA

H. Herman, Director
W. Dickson, Secretary for Mines.
The Hon. A.A. Billson M.L.A. Minister of Mines.

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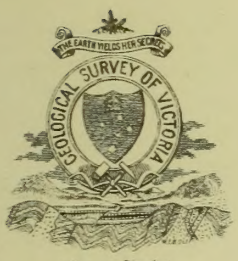



TRANSVERSE SECTION

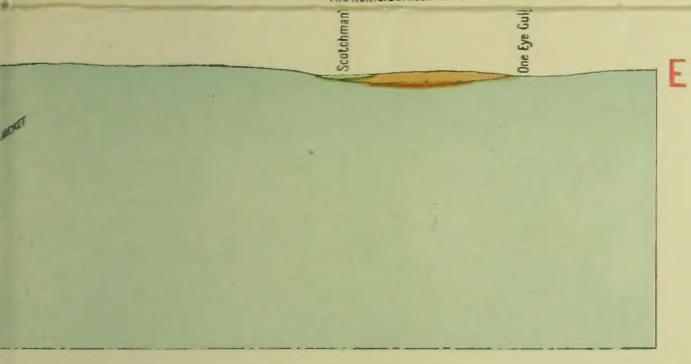
NOTE–
Upper Levels not Sectioned

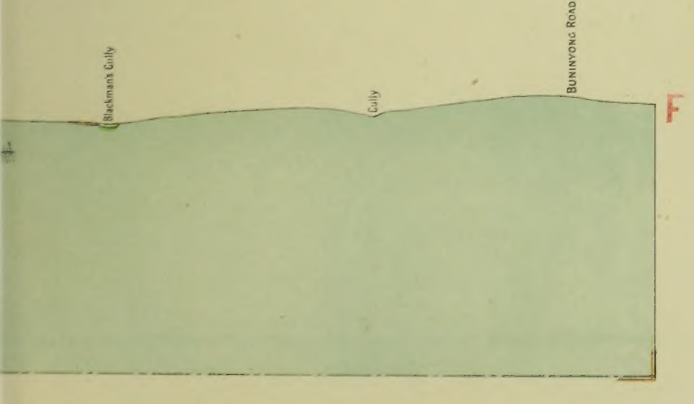
Plate I.A

# FIELD




H Herman, Director.
W Dickson, Secretary for Mines.
The Hon. S. Barnes M.L.A. Minister of Mines.



# SECTIONS ACROSS THE BALLARAT GOLD FIELD

## showing geological structure, alluvial deposits &c

SCALES.- horizontal and vertical - 16 chains to one inch.

### REFERENCE.

Recent Alluvial.

**TERTIARY.**

Post Basaltic gravels &c. Newer Volcanic. Va No 1 (LATEST) BASALT FLOW. Vb No 2 (EARLIER) " " Vc No 3 " " Vd No 4 " " } NOT EXPOSED AT THE SURFACE

WHERE EXPOSED AT THE SURFACE { Inter-Basaltic clays, gravels & drift. Sub-Basaltic clays, gravels & drift.

**PALÆOZOIC.**

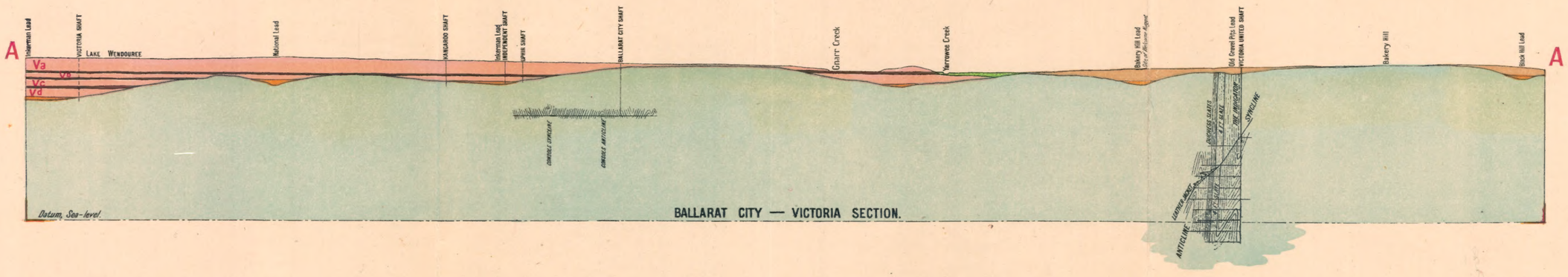
Ordovician shales, & fine grained-sandstones.

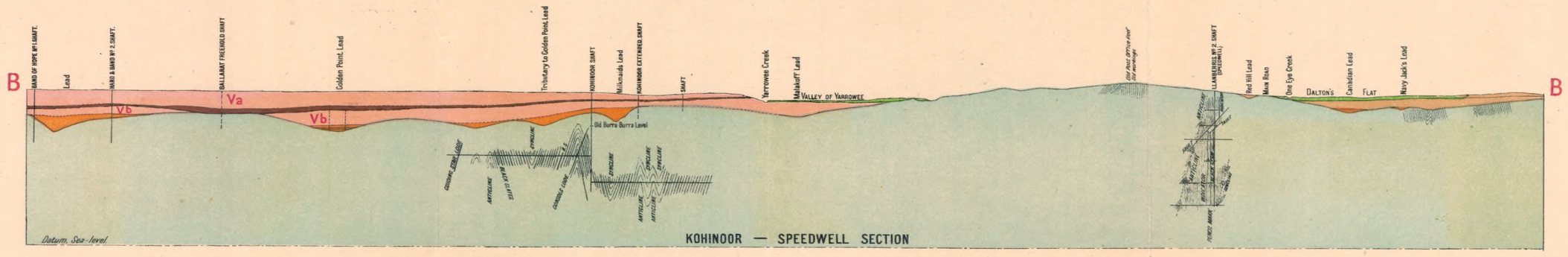
*NOTE.- The sections have been prepared from the surface and underground evidence wherever available. As much of the surface is covered by a thin layer of soil with but few exposures of rock, the data are not as complete as may be desired.*

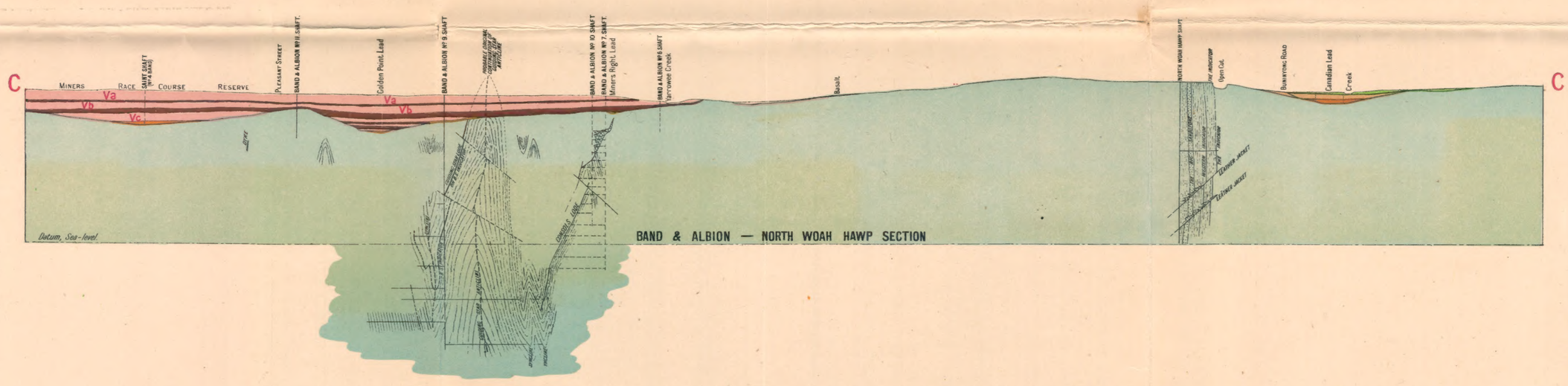
GEOLOGICAL SURVEY OF VICTORIA

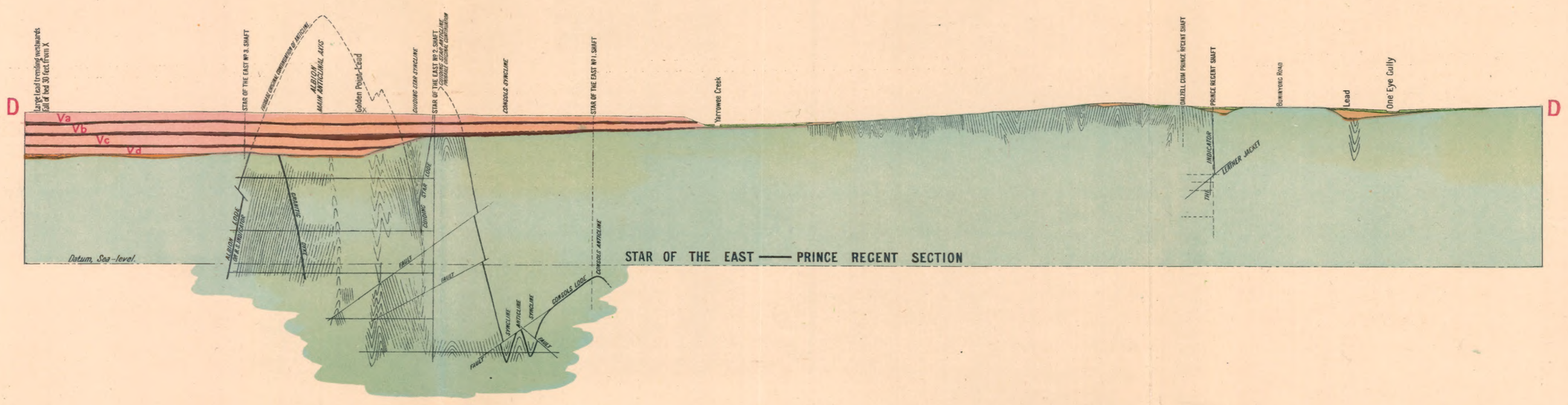
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W. Dickson, Secretary for Mines.
The Hon. S. Barnes, M.L.A. Minister of Mines.

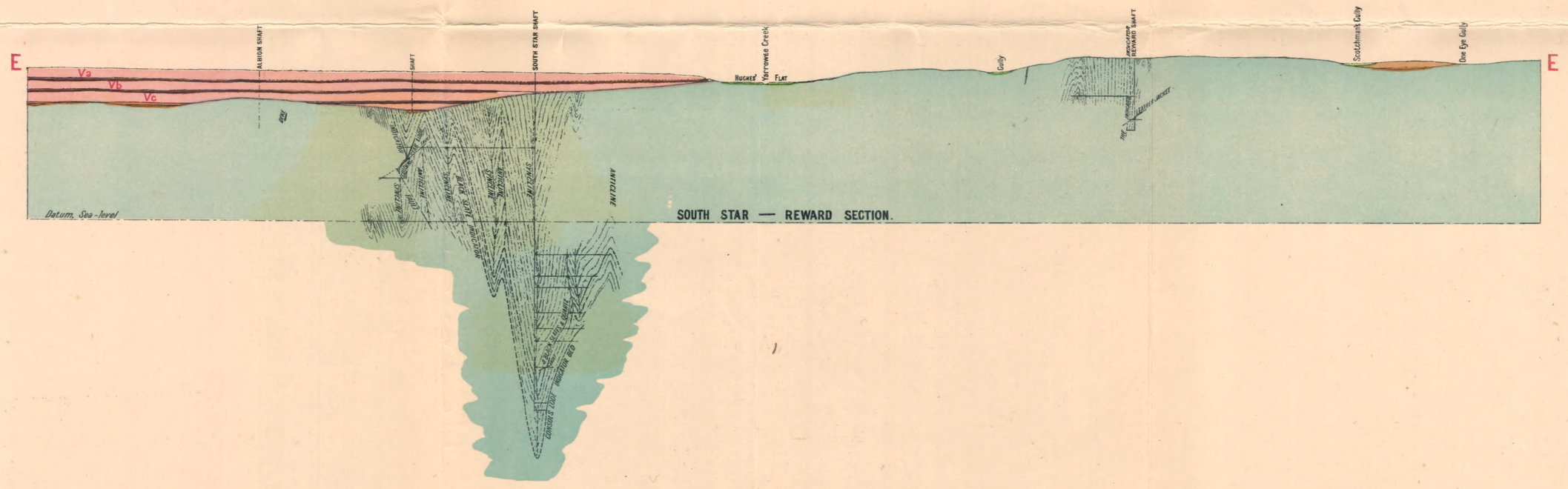
W. Baragwanath Jr
December, 1911.

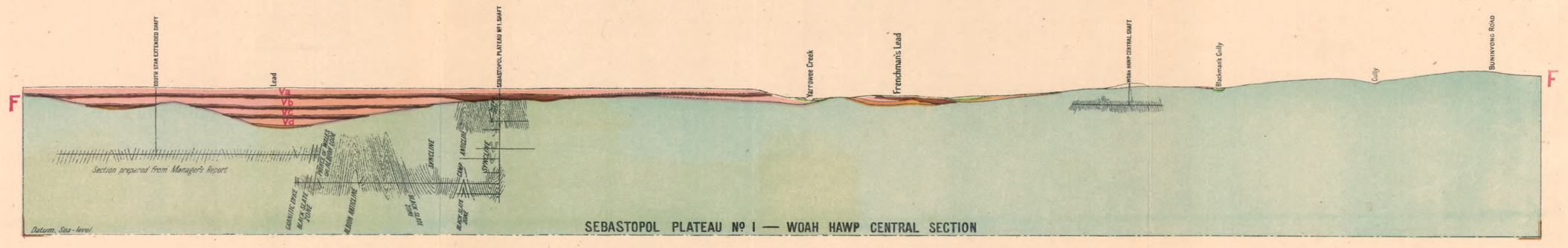


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